

October 23, 1961

# Aviation Week

*and Space Technology*

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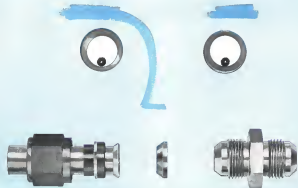
Survey Shows  
Urgent Avionic  
Research Areas

Martin Bullpup Bs  
On Douglas A4D



Special Report:

## IATA's 17th Annual General Meeting



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## Look into—CONICAL SEALS; by Voi-Shan

The General Seal is a soft, malleable crush washer designed for the conical seating surface of the AN type flared fittings.

Leakage problems often exist in low viscous gas systems where the conical surfaces of flared fittings and mating tubes are damaged due to manufacturing and handling procedures. The Voi-Shan Conical Seal flows into these imperfections and closes off the joint. Slight variations in concentricity are also corrected by the use of the General Seal.

Four equally spaced friction ribs hold the seal in place until the connection is torqued-up. The seals are Lox cleaned and packaged to insure contamination-free service. The Conical Seal is available in copper, copper-ni plated, aluminum and nickel. These material variations allow for compatibility and galvanic action problems. The seals are available from stock in the .02 through .46 in. sizes.

Voi-Shan's latest fitting design is a superior replacement for the present AND 100501 Bore design that eliminates the present use of the rubber "O" ring by incorporating the Conical Seal into the Bore. This is accomplished by a shorter depth due to the removal of the "O" ring, while still allowing use with the standard AN fittings. Advantages of this new design are:

1. Increase of the temperature spectrum from the -40°F to +400°F range to -420°F to +1600°F range.
2. Extended valve life. Due to greater resistance to temperatures in Cryogenic and Rocket applications.

Voi-Shan also offers the Sealit Connector System, which is a lightweight small envelope replacement for present flared and flareless fittings.



VOI-SHAN MANUFACTURING COMPANY  
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## TEFLON® 100 FEP now covered in MIL-W-16878D for military electronic hook-up wire

To electronic designers in the missile area, new opportunities are now open for improved wiring reliability. The recently issued "D" revision of Bureau of Ships' MIL-W-16878 specification for missile hook-up wire covers Du Pont Teflon 100 FEP resin as insulation for continuous service up to 200°C.

Three constructions are included in the new spec.

- Type KT—250 v. service (6-mil insulation)
- Type K—600 v. service (10-mil insulation)
- Type KK—1,000 v. service (15-mil insulation)

In all three types of constructions, the designer can obtain Teflon FEP over either tin-plated or silver-plated conductors—in unstranded lengths.

In many constructions, the excellent dielectric properties of Teflon FEP resin... its thermal stability... its low-temperature toughness... and its resistance to all chemicals and solvents will provide significantly increased reliability.

With this recent inclusion, FEP joins the older members of the family of Teflon fluorocarbon resins—the TFE resin—as approved insulations meeting MIL-W-16878. Only TFE and FEP resins are permitted for thin-wall constructions under this spec.

Another military application utilizing Teflon FEP resin is covered in MIL-C-17C—jacketing material for coaxial cable.

For more information about the properties and advantages of hook-up wire insulated with FEP resin, write to E. L. du Pont de Nemours & Co. (Inc.), Dept. AV-10, Room 2356T, Nemours Bldg., Wilmington 98, Delaware.

In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

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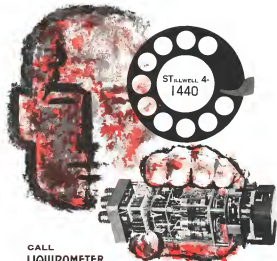


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The Whirlwind Self-Trainer is designed to move the student through initial training right up to solo flight, without requiring dual flight instruction. This means that a single instructor can handle a number of students simultaneously through the training process. And, when the actual training is completed, the Whirlwind may be easily detached from the platform so become a primary helicopter trainer.

For complete information on this versatile, low-cost training system write for Data File AFW-1655-1.



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Melting Products Corp.

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# This is all MIDAS would ever see

Sootblites of the U.S. Air Force MIDAS (Missile Defense Alarm System) program are designed to set a world infared world — a complex pattern of first waves. As they endlessly circle the earth, they'd pay no attention to the pattern of peace: the intense flames generated by forestry, haze, and factory. But should an all-out missile attack be launched

against us, MIDAS would report it instantly — doubling the warning time we'd get from present systems.

To tell us advance how MIDAS will work when actually on orbit, Lockheed put its infrared components aboard the Agena satellites originally used in the Air Force's trail-blazing Discoverer program. This happy hybridization is con-

tributing significantly to the MIDAS development program — at a minimum cost in days and dollars.

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## EDITORIAL

### Economic Effects of Space Flight

Don C. Marshall, vice chairman of the board of General Telephone & Electronics Corp., reviewed the economic effects that the space program will have on industry during a panel discussion on the global effects of space flight at the recent American Rocket Society Space Flight Report by the Nelson. Because of the direct impact of space flight on the trends that he forecasts, Marshall's remarks are excerpted from his talk.

I would like to concentrate my attention on the tremendous contributions which space science and technology will make to the entire spectrum of research and engineering in the future.

I am speaking at a time of great excitement. Our scientific knowledge and our skills in applying that knowledge are directed toward meeting the challenge to enter space. As a result, new fundamental knowledge is uncharted and further advances are made in engineering, which in turn is fed back into many fields of endeavor. This phenomenon has occurred before.

However, space science and technology will touch, transcend all of the other examples because it is not an industry to itself but reaches across all industries, directly and indirectly. As major engines of growth and growth through the development, the state of the art in chemistry and engineering is steadily advanced. In the same token, the development of new types of rocket fuels will feed back new information and new techniques to the entire chemical industry. We will see such specific benefits in aircraft, simple and high efficient propellers, jet aircraft, and submarines, and entirely new concepts in power generating equipment.

The entire field of instrumentation in its broadest sense, will benefit greatly from the new electronic, hydraulic and mechanical systems and devices and so the branching and guidance of space vehicles. Electronics particularly has made major contributions to space flight, but it will also be one of the prime beneficiaries.

Great advances have been made in electronic guidance and control equipment because of the requirements of space flight—and these developments will be translated into new products in connected aircraft control, guidance and navigational systems, data processing, and the other related areas of electronics.

A fascinating new field of research has evolved out of the studies being made on the effects of space flight upon the human being. Aside from the obvious physiological requirements of sustaining life in providing air, food and water under the highly abnormal environment of space, begins there is the added factor of the psychology of space flight—the reactions of the human being to the effects of the earth's tremendous speed and the resultant demands upon his mental processes.

As the pressing problems of recovery of space vehicles into the earth's atmosphere, are solved, many new insights of man's ability will come—especially new combinations and forms of metals capable of withstanding enormous heat and pressures—and these developments will find their way into many other industrial applications.

We will develop new understanding of materials, not only in terms of producing ourselves from it, but far more important, harnessing this phenomenon to work for us.

Great advances have been made in understanding the weather and climate conditions as far as meteorological research through cloud modification have not proved so useful on a large scale — the rain total of our knowledge is growing steadily.

The potentials are especially strong in space communications—more of use of satellites in outer space to form the nucleus

of a vast new world-wide communications system. Its possibilities are limited only by the imagination.

However, no matter what field we are talking about, the main thrust and indirect benefits to be derived from this nation's space program are no more than potentials. The big challenge to the individual companies in American industry is to ensure that they are sufficiently advanced in research and development to recognize an opportunity when they see it.

The total expenditures by industry in research and development this year will exceed \$10 billion. That total is more than triple the amount spent ten years ago. And yet we have barely scratched the surface in conducting new experiments and developing new products and services. Industry's research and development expenditures must be made, then doubled over the next seven to eight years, to a total of at least \$20 billion annually. The handwriting is on the wall, and that handwriting is: Today's research is the key to tomorrow. And I am not talking about taking on minimal research so that you can say you are doing research. I am talking about doing, producing, results—that will create, in our company, a role in the future, in space technology as an other technology.

First in the future will bring a host of changes to the laboratory and the manufacturing plant. It will bring changes in just about every aspect of industrial operations. The big question is management's ability to sense these changes and recognize, and then to do something about them. This is not easy in these days of complex current problems. How can management pay sufficient attention to the future when coping with the present is difficult enough at all? Management has no alternative in space-related activities, it is a matter of a matter that is practically exponential—management will have to do a far more complex and more intensive job of long-range planning. That is the only way that we will be able to get the real sense of direction and put into it our space efforts. In approaching the opportunities ahead of us and developing sources of action to take full advantage of them. To get it another way, it means setting new goals and greater goals and going about setting a sound course to reach them.

Meeting this need will be a difficult task because of the increasingly complex nature of industry. A few years ago, companies tended to fill one rather clearly defined categories.

But the picture has changed. Today we have the great composite picture, and that is getting more blurred all the time. The line between of course, from the greatly increased emphasis on research and development which has provided tremendous increases in diversification, and yet far greater diversification and increasingly industrial products will continue all of us in the years ahead.

Industry had some fairly predictable targets back in 1957 when the first Sputnik was fired. But that is no longer true. With the advent of the space age, we have moved into an entirely new operating environment, which is opening us to opportunities as enormous as any that of tomorrow you can find or imagine. You can get some idea of the scope of this activity when you hear it said that more than 3,500 industrial organizations, private laboratories, and universities are participating in various aspects of the space program—ranging all the way from highly advanced research in the production of hardware.

In the years ahead, this activity will broaden tremendously, and all of us in industry will need to be the strongest of industrial counterparts, looking at the future with imagination, breadth of purpose, and urgency. Otherwise, we will never get off the launching pad.



## FAIRCHILD BASIC RESEARCH LABORATORY ADDS A NEW DIMENSION TO PHOTOGRAPHIC CHEMISTRY

New insight regarding the interaction of light with solid state photoconductive surfaces is being gained at Fairchild's Basic Research Laboratory. Defense Products Division scientists are also discovering new facts about the role of free radicals and molecular complexes in the photographic development process. Such knowledge can produce photographic materials of unprecedented speed and resolution which are capable of virtually instantaneous processing. Another result can be very thin solar cells of wide area and sensitive to radiation from the ultraviolet to the infrared which can be of great value in space exploration. Vastly improved developers can also be focused on new data concerning photographic chemistry. The basic and applied research and development is contributing advanced products and techniques for military and industrial application, ensuring Fairchild's command leadership in the photographic field. The Basic Research Laboratory and its achievements are available for your programs. For a brochure and further information, write the Director of Marketing, Defense Products Division.



## WHO'S WHERE

### In the Front Office

**W. A. Stepp**, vice president and general manager, Thompson Radio Woundings, Inc., Los Angeles, Calif.

**Fred Moore**, president, Arconix, Inc., Los Angeles, Calif.

**Dr. John Anthony Hines**, a director, Composites Corp., Dallas, Tex. Dr. Hines is vice president for aerospace at the Air Force Institute of Technology.

**Charles A. Uhl**, vice president research, Irvine, Calif. Uhl, president, Canada and Donald A. Doon, director, aircraft and aircraft.

**Heather D. Sullivan**, a vice president, American Airlines, Inc., Los Angeles, Calif. Sullivan is manager of American's Chicago office.

**Dr. Charles H. Heston**, vice president and general manager, Goodrich High Voltage Laboratories, Inc., Burlington, Mass.

**Philip B. Taylor**, former assistant secretary of the Air Force for material development, is director of The Mercury Corp., Van Nuys, Calif.

**George W. Hook**, president, United Air, Inc., Los Angeles, Calif. Hook, 37, is married to Ralph D. Hook, vice president.

**J. W. Thompson**, president of the civil aviation, Thompson Defense, Division of Space Equipment Corp., Torrance, Calif. He continues to be a corporate vice president and director of Space Equipment.

**Dr. J. J. Harfield**, vice president research, Life Sciences Department, Pacific Medical Research, Torrance, Calif.

### Resumes and Elections

**James B. Leflore**, director of the Flight Safety Foundation and the General Electric Co., Guggenheim Aviation Safety Center, will receive the 1961 David Guggenheim Medal next month. Leflore is a member of the American Society of Mechanical Engineers, Society of Automotive Engineers and Institute of the Aeronautical Sciences, a member of the Aeronautical Society of America, and a member of the Aeronautical Society of America. He is also a member of the Aeronautical Society of America. He is also a member of the Aeronautical Society of America.

**W. Z. Skrzyski**, assistant director, is receiving the 1961 David Guggenheim Medal next month. Skrzyski is a member of the Aeronautical Society of America, and a member of the Aeronautical Society of America.

### Changes

**Dr. William A. Shaw**, chief scientist, for the Aero Space Division, Seattle, Wash. Dr. Shaw is now Dr. Shaw is chief of physical technology.

**Nicholas M. Gordon**, project design, is now vice president, KPCB, a corporate system, Lockheed Division, Space Technology Laboratories, Inc., Los Angeles, Calif.

**Lois J. Graham**, director, general contracts, Chevrolet, is now vice president, Whittier Division of United Aircraft Corp., East Hartford, Conn., national sales manager. Dr. Graham is now vice president of the general manager of Pratt & Whitney's Florida Research and Development Center, West Palm Beach, Fla.

## INDUSTRY OBSERVER

► Most frequently mentioned use for an Apollo follow-on spacecraft is a reconnaissance mission. Payloads, ranging up to 15,000 pounds, for the three main Apollo could be expended to carry live if the vehicle's sensor modules were equipped with sufficient life support equipment. Follow-on that is fairly selected will be determined largely by availability of location.

► Proposals for a design study of a radiation weapon or "death ray" using high energy light beams of optical nature have been suggested from industry by USAF's Rome Air Development Center. Proposals are due early next month.

► Russian design team headed by Glig K. Astashev is working on a variety of new STOL aircraft types, including one with several jet engines. Radio controlled models of the craft were demonstrated to Soviet reporters recently at Astashev's Kiev plant.

► Frequency in the K band, at roughly 13.5 gigacycles, probably will be selected as the optimum operating frequency for the Dornier four wheel glider's communications system. Chief advantage of a system using that band is its ability to transmit through the ionized sheath that surrounds vehicles re-entering the earth's atmosphere and prevents use of many microwave frequencies (AW Aug. 26, p. 24).

► Naval Research Laboratory hopes to launch a Leda II satellite, similar to the first, into a highly inclined orbit within the next few months in a constant experiment in very long frequency propagation. Results of the test experiment were limited by failure of the second stage of the Thorast vehicle to separate from the Thorast and Leda satellites, which prevented Leda's dipole antenna from extending.

► Four Leda-C satellites, intended, which can be used by Polish submarines for precise determination of position, recently have been installed in the Mediterranean and Norwegian seas and the north and central Pacific Ocean. The Soviet-developed system enables submarines to establish launch sites where positions are known to within several hundred feet, in which they can proceed by tactical navigation after localization begins.

► Aero's Locomotion Division has begun testing a modification developed at its own expense that would convert its turbojet 915 engine to a turbofan powerplant which afterwards would produce about 2,500 horsepower. Locomotion has indicated it would like to flight test the new power plant on a McDonnell Douglas test plane—such a Locomotion's great military interest has not yet received official support.

► Among the possible boosters being studied by Martin Co. is a two-stage vehicle for direct ascent to the moon, with the booster using 24 Rocketdyne 12 liquid hydrogen engines. Booster would be about 46 ft in diameter and 150 ft tall. Martin has investigated availability of propellant wind tunnel time for test firing a scale model.

► Investigations by USAF's Aeronautical Systems Division, aimed at overcoming compressor block still in turbine engines operating at extreme altitudes, have shown that automatic feedback of air flow the high pressure section to the engine inlet area will permit flight at much higher altitudes.

► Recent delay of the first attempt to launch a Minuteman from a ship (AW Sept. 18, p. 61) has been attributed to a apparent second stage ignition signal generated by the guidance and control system when a soldered connection broke loose.

► First General Electric Test probe is scheduled to be launched by an Aero B-5 from the Pacific Missile Range Nov. 15 to coincide with another ship-to-ship test.

# SILICOLOGY

## Studies in Silicones

HOW THESE TIME-TESTED MATERIALS CAN WORK FOR YOU

### Silicone Rubber Takes to the Air ... And a Customer Tells Us Why

A recent letter from a Union Carbide Silicone Rubber customer is one of those that makes us like to read our mail. It's quite plain as it follows in the hope that it will serve as a "reference" on the properties that have made silicone rubber virtually indispensable in modern aircraft.

The letter is from the Engineering Laboratories of the Electric Aviation Company, Wire and Cable Division, Fort Worth, Tex., which states:

#### RESISTS OZONE, CRACKS, COLDS, AND MOISTURE

"Silicone rubber, because of its excellent heat resistance and dielectric strength, has been specified as insulation on aircraft lead wire for a number of years. More recently, these same properties have provided its use on ignition cables for automobiles, aircraft, and aircraft vehicles. Spark plug leads attached to the cables are also made of silicone rubber because of the continuous high temperatures to which they are subjected.

"In addition to dielectric and heat-resistant properties, there are other advantages in the use of silicone extruded insulation. It is readily compounded for extrusion, extrudes smoothly, and strips easily from the conductors. The finished wire has excellent shelf life as well as good service life. It can be used at high altitude, extreme flexure at low temperatures, and resists ozone, corrosion, and moisture."



Silicone rubber-insulated wire and cable, capable of withstanding continuous high temperatures, is used in powered aircraft engines.

#### MORE RELIABLE FOR CARS, TOO

The letter gives a forward-looking lead to Detroit as it goes on to state: "Several automotive engine designs, for greater efficiency by operation at higher temperatures, demand further increases in the requirements for this more reliable igniting cable.



U.S. Navy's FV-8 fast-lying aerialist, which can stay airborne for extended periods of time, carries America's most powerful missile rifle as part of the nation's defense against tank attacks.

Brake Corporation, Schenck Division, is one of America's customers. Brakes has supplied the silicone-insulated spark plug leads for engines that power such parts of the skies as the Lockheed Super Constellation type turbopropeller designated by the United States Navy as WV-3. Able to surge for out to sea and carry out special duty touring in inland, the long-distance plant carries America's most powerful search radar to high altitudes to avoid serious limitations from radar's inability to bend over the horizon.

#### WHERE CAN SILICONES BENEFIT YOU?

We'll also find silicones needed against boiler buildup, the reliability of military vehicles, tanks, and trucks. And if you're a truck fan, they're virtually a "must" to check our news.

Aircraft technology and development are changing more rapidly than ever before. Perhaps you are overlooking a good bet—some place in the design of your products where a Union Carbide Silicone Rubber can serve you improving quality at a surprisingly low cost. Send the coupon for further information.

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### Civil-Military Space

## Washington Roundup

National Security Council had an impromptu discussion of the civil-military discussion of space projects on Oct. 15 as the result of newspaper reports of Gen. Bernard A. Schriever's remarks on the subject at the American Rocket Society Space Flight Report to the Nation. The seventh council, which forces such matters to the National Aeronautics and Space Council, came to no conclusions and took no action.

Vice President Lyndon Johnson, who heads the Space Council, is fully aware of the direct within the services over the division of space activities but is impressed with National Aeronautics and Space Administration, because the industry agency speaks with one voice through Administrator James E. Webb. He has indicated he would like to see Defense Department do the same.

Development of Air Force's long-range medium range ballistic missile (MRBM) to cover tactical ranges over 100 mi. has been ordered by Defense Department. Army's Polaris missile is limited to 100 mi. by Defense order. In securing Army's tactical missile, Defense has begun taking action to eliminate the overlap in range. First version of the 1961 budget will be the 10,000 lb., 35 mi. range Sergeant, which has not yet become operational.

### Solid Booster Gloom

Proponents of large solid-propellant boosters are optimistic and somewhat glibly overrating the report, due 15 Nov. of the Long Launch Vehicles Group of the NASA Defense Liaison Study. NASA has not yet decided that a solid Navy vehicle should be developed parallel with a liquid-fueled Navy but direct intent to the same and some elements feel the vehicle group has other leads to solid launch.

The picture is complicated by Air Force's preference for solid with a maximum diameter of 120 in. NASA's position 240-in. diameter may compromise at 160 in. If a solid Navy one is developed it may be close closely and in a liquid one. One bright hope for solid proponents is that the group may recommend evolution rather than direct ascent for the Navy flight. Then NASA's goals would concentrate on use of the Space and might not build a liquid Navy immediately. In that case, a solid Navy project is almost certain. Air Force would like to go to the liquid 240-in. thrust solid booster under a two-stage task program, to strengthen its role in space.

Rocket assembly Soviet or force ballistic will be recognized next January and aimed under a new title "Aviation and Cosmonautics."

### Concern Over Missiles

Defense Department is concerned over design in the Midcom early warning satellite program and apparently has once considered shifting assignment of it from Lockheed to the Aerospace Corp. Some parts of the program are 10 months behind schedule. At least one version of a Midcom to receive data from satellites that will form a radio-relaying link under Project West Wind has been delayed for political and technical reconsideration of the feasibility of such a link.

Several aerospace firms in the Boston area are mapping a new strategy in their attempts to have Congress change space patent law (see p. 16). Patent laws have appeared at such hearings that they can only receive requests for research because they are in a long review process with a new law. Set the Boston firms will send Congress proposals instead. As a part of the same campaign, the Government Aviation Committee of the Boston Patent Law Area, representing more 15 firms, has drafted a study designed to show that federal legislation is needed ending patent's patent rights.

### Transportation Report

Commerce Secretary Luther Hodges' report to President Kennedy on a national transportation policy, which he hopes to submit by Nov. 1, will recommend specific legislation and executive action to strengthen transportation and will not let just another research study, Hodges has indicated. The secretary also has warned that the report will recommend actions that will cause unhappiness in some segments of the transport industry.

John Rabe, assistant secretary of defense for research and development, was scheduled to visit European countries this week for further discussion on exchange of research and development knowledge and projects with the U.S. He also will suggest some facilities of the National Security Agency, which new reports to him.

USNS and Lt. Col. Michael Rosenzweig, Vermont, who allegedly donated the U-2 reconnaissance aircraft with one "super probe" and that, with assistance of a delegate to last week's Third Communist Party Congress in the U.S. to whom he is backing, "the art of sharp shooting." Vietnam is for "because known the world over." Rosen said: "Some sincerely admired it, others regarded with envy, but no one admired indifference."

—Washington Staff







## Justice Studies Carrier's Plan For Non-Profit Satellite Operator

**Washington**—Plan for a non-profit company to develop, construct and operate a commercial communication satellite system, proposed by an ad hoc committee of international carriers licensed by the Federal Communications Commission, is now under study by the Justice Department, whose comments are expected next week.

Orbits of the plan show American Telephone & Telegraph Co. will dominate the system because it will provide most of the required capital, despite provisions which limit its representation on the non-profit company's board of directors to a standard minority.

The committee plan, which Western Union dominated calls for each carrier investing \$500,000 in equity in the non-profit company to carry two satellites on an orbit of 10,000 miles. In addition, there would be three public domain satellites operated by the President. U.S. carriers which do not invest but license stations indirectly would be degraded out of service.

In response to an FCC request, five companies on the committee indicated their intent to invest in the venture while two others gave qualified reasons for not doing so.

Not mentioning directors who might be named to represent foreign communication agencies, the legal word would be that 11 and 100 satellites each in the system would be operated by AT&T.

On this issue, AT&T does not appear to have a dominant influence. But the proposed non-profit corporation is said to be a small one. If AT&T and other carriers could not be persuaded to invest, the company would be forced to raise the money in the public market, or could be forced where profits operation did not want to invest in three new facilities.

The plan does not include the question of whether the space communication system should use large numbers of satellites in random, low altitude polar orbit or a few in synchronous orbit.

The plan also says the system will be used in the light of the best information available from further research and development. We expect that an operational system would be established within 10 years, utilizing a hybrid of satellites first placed into orbit and then progressing to improved satellites in more difficult orbits as that becomes feasible.

The plan also says that limited numbers of satellites may be possible by 1974 and an operational system may be in commercial service by 1975.

Joint investments required to establish an operable system for various com-

munications systems are estimated to be as follows:

- \$40 to \$80 million: 20 medium altitude satellites in random polar orbit
- \$10 to \$20 million: Two pairs of satellites in synchronous orbit
- \$67 to \$211 million: 20 medium polar orbit satellites plus 10 medium altitude satellites in random equatorial orbit
- \$75 to \$150 million: Three pairs of satellites in synchronous orbit

The FCC has given interested carriers, companies and government agencies until Oct. 30 to submit comments or counterproposals. Then the committee will decide whether to hold public hearings.

Chairman Harold D. Long (D-La.) of the Senate minority subcommittee is expected to announce his hearings on the whole subject of the space communication system during the next week.

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## Navy May Order 900 Drone Helicopters

**New York**—Naval officials will order about 900 impetus-driven drone helicopters for use aboard amphibious assault ships, according to a report by James D. Fox, president of the Cowles Co. of America, Inc. told the New York Society of Science Analysts last week.

President Fox said the Navy's plan would involve the purchase of 300 ships with autonomous drone helicopters, which would be used to support the fleet.

Not all of these drones would be used for the fleet. The Navy will be asked to build the best information available from further research and development. We expect that an operational system would be established within 10 years, utilizing a hybrid of satellites first placed into orbit and then progressing to improved satellites in more difficult orbits as that becomes feasible.

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munications systems are estimated to be as follows:

## X-15/B-52 Studied as Blue Scout Boosters

By Russell Huxley

**Los Angeles**—North American X-15 and its Boeing B-52 mother ship could be boosted in a reusable booster stage by USAF's Blue Scout rocket motor, according to the defense to go ahead and at a cost of \$59,000, project officials announced.

The proposal is being made partly by North American and by Ford Motor Co. Aeronautics Division, prime contractor for the Blue Scout series of light, ground launchers, solid propellant, spin rockets under contract. The proposal has been presented to officials of the Air Force Systems Command and Headquarters USAF. Leaders of the program to use the X-15 as a reusable booster for altitude profiles and high altitude probes and the service is still studying the plan.

North American and Ford officials said the service needs a booster for its launched aerial research but the proposal to USAF includes spin and a booster. The system already has the ability to launch a ballistic missile as well as a short range rocket motor.

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**ARTIST'S CONCEPTION** shows proposed utilization of North American X-15 as reusable space booster to launch twice as Blue Scout motor. The X-15 would separate from the B-52 mother ship at altitude of 50,000 ft., climb to 150,000 ft. and launch Blue Scout. No other X-15 modifications are anticipated in North American.

at cost \$59,000 and recover them in one hour after that launch is complete. It would take about two and a half weeks for modification to the two airplanes. Flight tests could begin next month from the go-ahead decision. The service needs a booster for its launched aerial research but the proposal to USAF includes spin and a booster. The system already has the ability to launch a ballistic missile as well as a short range rocket motor.

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### Saint Subcontractors

- New York-Maps subcontract activities for USAF satellite imagery program, formerly called Stant, was awarded life long work by Radio Corp. of America, which provides color, color-fractions, infrared and laser imaging.
- Largest General Corp. computer system and associated ground equipment.
- Minneapolis-Honeywell guidance system.
- Aern Corp. structure and interiors.
- Westinghouse Corp. and Emerson Electric Co., cable routers.
- Garrett Corp. temperature control unit.
- Douglas Aircraft Co., vehicle housing.
- Applied Electronics Co., ground handling and precision optics.

### X-15 Flies 3,920 mph., Heating Nears Limit

**Edwards AFB, Calif.**—A second speed of 3,920 mph was attained Oct. 17 on the X-15 by Test Pilot Joseph A. Walker of the National Aeronautics and Space Administration. Six days after the number two X-15 was pushed to a record altitude later confirmed at 217,000 ft, Walker flew the number one aircraft to Mach 5.75 at an altitude of 102,000 ft. Maximum recorded sea-level heating of 1,100°F was near the design limit of 2,200°F.

## Daddario Sees Change In NASA Patent Law

Washington—House Science and Astronautics and Space Subcommittee vice chairman Rep. George Brown (D-Calif.) announced that Congress must revise the National Aeronautics and Space Administration patent law to enable NASA to relinquish title to inventions made by private contractors.

<sup>†</sup> Schweizerische Chemische Industrie AG, Doldingen 10, CH-4050 Basel, Switzerland.

### New Soviet Helicopters

Two new helicopters, the V.2 and the V.8 produced by the Mikheev MI design office, have been announced by Russia. Both were developed from the earlier MI and MI-4 types and their names mean "new" and "old."

The V-2, which is powered by two light gas turbine engines, can carry eight passengers and 170% more freight than the M1, which was powered by one reciprocating engine. It will be used for general utility work such as crop spraying and for local delivery. The V-5 will carry 20 passengers and two tons of freight.

## News Digest

**First German-built Lockheed F-35A**  
and Fiat G-91 aircraft have been handed  
over to West German air force.

**USAF/Kennedy H-43B** turbine-powered helicopter was flown to an altitude of 52,000 ft last week, claiming a world record for Class E HO helicopters (3,285 to 6,614 lb gross weight). Flight set a U.S. record for all helicopters, exceeding the 29,777 ft altitude reached by a Cessna Y1141 in 1977. The H-43B flew on the same circuit which set a world altitude record of 26,765 ft for helicopters carrying a 1,000 lb (2,204.6 lb) workload last May 25.

Castle-Wright Corp. repaired the Aerospace Industries Assn. last week, but 10 days after scrapping from AIA on a decision by the's former management.

Micro-miniature digital computer, weighing only 10 oz. and occupying 5.4 cu. in., has been constructed from semiconductor networks by Texas Instruments under Aeronautical Systems Division sponsorship.

Gerhard Neumann has been appointed general manager of the General Electric Co.'s Flight Propulsion Division, succeeding Neil K. Pierantoni, who has been assigned to the firm's Project Apollo team. David L. Shaw was named general manager of the large jet engine department, and Edward Wolf was appointed general manager of the small aircraft engine department.

Three Pratt & Whitney rocket engines have been appointed finalists that represent all the companies' East Hartford, Conn.-based. They are Edward D. Brown, advanced power systems; William H. Sans, advanced jet systems; and Frank T. Spangill Jr., ordnance.

**Disposon XXXH** was launched from Vandenberg AFB, Calif. and was recovered by its catch net in 196 m.

**Robert F. Hart** was elected president of Grand Central Baiter Co. Last week, according to Bert C. Monahan, Minneapolis, a vice president of Litchfield, Minn., based Litchfield Corp. which recently acquired complete ownership of Grand Central, had been serving in the position temporarily. Hart had served as Grand Central vice president operations since last June and previously was in charge of F.H.B. manufacturing at Litchfield. Hart and G. R. McKersie, Grand Central vice president research and engineering, were elected to Grand Central's board.

**KAMAN HUSKIE  
NEEDS NO AIRSTRIP,  
WILL PAY FOR ITSELF IN  
MISSILE SITE SUPPORT**



to support an Atlas at the missile base by the wing airport, 10-hectare areas of land must be reserved for a maximum need runway. Since missiles come high today, and the cost of construction and maintenance add to the initial cost of the installation, it is imperative that all the land be used most profitably... as a missile site. Kamov's turbine-powered HUSKIE helicopter needs no special preparation or consideration to support the missile site... not to mention the fact that it can help to **build the site itself** by ferrying in personnel, equipment or payloads up to 3,000 lbs. Kamov HUSKIES are ready to prove their economy... as

THE KAMAN AIRCRAFT CORPORATION, BLOOMFIELD, CONN.



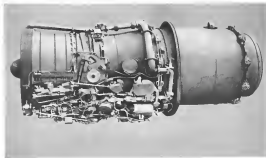


# ROLLS-ROYCE

# SPEY

WILL POWER THE  
DE HAVILLAND TRIDENT  
B.A.C. ONE-ELEVEN  
BLACKBURN BUCANIER 52

## BY-PASS JET



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ROLLS-ROYCE LIMITED, DERBY, ENGLAND  
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## AIR TRANSPORT IATA Delegates Strive to End Dissension

International carriers' meeting faces conflicts over fares, bilaterals; small airlines to bid for strength.

By I. I. Doty

Sydney, Australia—International Air Transport Assn's 17th Annual General Meeting opened here today with delegates determined to restore a unity that has been shaken during the past two years by a controversy over rates and a bitter struggle for control of the powerful executive committee.

Bilateral issues mean less another problem, which—although outside the province of IATA—is placing a new strain on large carriers with a strong hold on executive committee membership. The quarrel between U.S. and smaller European airlines over the capacity restrictions of bilateral agreements. Whether IATA will overcome these problems with any show of strength will be put to test later this week when nine new vacancies on the 1968 committee are filled.

At last year's meeting in Copenhagen (AW Sept. 12, 1966, p. 48), several small carriers made a strong move to fill vacancies with representatives from their ranks. It failed, only because Sir William Hildred, IATA director general, kept a firm hand on the bidding procedure. No nomination was accepted from the floor and only delegates recommended by the executive committee were elected to the executive committee.

Small carriers won't get a knockout this year through a possible break between U.S. and European airlines represented on the committee. Their "winners" which together hold two seats on the committee will only run open for re-election here but nothing over bilateral issues for close to two years. The loss, coupled with a decision on rate structures could weaken the solidarity that has helped the group to achieve its present status. IATA was formed immediately after World War II.

The majority of problems facing IATA this year can be traced to executive meeting capacity. Excessive capacity is a prime reason for the industry's financial dissension. The high cost of operating an expanding volume of available seats often at low fares will be the breakdown point.

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There is talk here that dissident carriers may try to elect Hildred. The executive committee among smaller carriers that they are scheduled only annually by Hildred and a hard core of the executive committee has not attended since last year's meeting. However, Hildred holds little support of the executive committee members attending, including Pan Am, which has always played a dominating role in IATA affairs.

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of foreign flag carriers serving U.S. gateway is the real issue behind the industry's foreign carriers held for the U.S. as bilateral negotiations. The capacity problem has also brought an upward drive for lower fares, but these attempts are constantly frustrated by disagreement over major price increases (AW Aug. 7, p. 16).

Hildred stressed the significance of expanding capacity in his opening remarks here today. He noted that 1975 main passenger flights were scheduled on North Atlantic routes during the first six months of 1961 there had been during the same period last year, and that seating capacity expanded 47% while load factors fell 16 points in the face of a 12.3% increase in traffic.

Market Expansion Urged

"There is cause for 'concern' over the problem," he said, but not as much for pessimism. He urged the airlines to expand their markets, describing the need to deliver as presently a public service but one that is becoming "more and more a commercial endeavor." He added:

"The largest, though not necessarily the most important part of our traffic already depends not on the people who must go somewhere, but on those who want to be somewhere to go. In this connection, he noted that if the airlines had filled all their capacity in 1960, the world would not have had enough hotel beds to lodge all the tourists."

In a move to ease the dissension over bilateral agreements, Hildred said:

"The past year has been notable for a series of government negotiations on bilateral agreements which, in many cases, have ended in stalemate and even animosity."

"They are not IATA's business, but their result and even their atmosphere are bound to have some effect on our work."

In an obvious reference to the U.S. stand on control of capacity, he said:

"It is a mistake of policy to approach these matters on the basis of who owns what share of which traffic line," he added.

Obviously, no one is making a serious attempt today's traffic. This preoccupation with the need to split a little apple will look like the ppr will only divert attention from the common objective of governments and airlines alike to increase the size of the market, to give a bigger apple so that everyone can have a good bite."

Since the U.S. Civil Aeronautics

### Panair Orders Caravelles

Paris—Panair do Brasil, Brazilian Air Line, has ordered four Sud Caravelle (D40) for delivery in the spring of 1967. The South American carrier also took an option on two additional Caravelles.

The new order brings Sud America's Caravelle backlog to 146 for orders plus 30 options.

Based partly on the urging of U. S. international carriers, but already publicly stating its intention to protect U. S. airlines against foreign competition, Hilda's plan and advice are not likely to be as revolutionary as the better feelings between the two airline groups.

As in the past, majority of IATA member airlines in such agreement on a proposed inter-industry is another matter. "I am sure that the airlines will be strong to agree at unanimous support for a selected potential issue, followed by a final vote on a Pan American proposal (AW Oct. 3, p. 36), but the industry will not do so."

Most carriers want the group to have several informal compromise moves have already been made here to reach some settlement. At least one small group might be able to agree on a way to use some work on the committee to some extent by dropping its objections to the group but, as a result of these all the four fails.

Hilda said he has specific reference to the group has in his report to the meeting. He did not feel lower than expressing the hope that the "industry would become the vehicle of the factors behind the industry's solution."

"The 17-day North Atlantic session has produced good results, but it is not enough. The industry is changing but it is not a healthy development. Charter is a useful means of expanding traffic in the off-season, but charter in the high season could well be harmful."

#### Supersonic Discussion

The supersonic transport was also expected to be a major topic during the meeting. The IATA Technical Committee is expected to devote a substantial amount of its efforts later this week to the transport.

This report will say that the development be inter-related with the present development of air transportation. It will point out that many needs involved for the transport are problems which face the industry today in the operation of subsonic jets. It will also stress against allowing supersonic transport to be a separate development to produce several first experience and operating improvements.

Hilda voiced no opinion on the supersonic transport at his report to the IATA.

• **Supersonic transports**, of this type, will be expensive beyond all previous experience. It will be beyond the capabilities of either airlines or manufacturers to finance development. • The effect of noise, noise and more restrictions on supersonic transport are certain to still influence. He also warned "If the jet has produced over-optimism, the supersonic transport could lead the world with it."

• **Governments** have acknowledged that public financing of expensive transport development will be a necessary but have indicated a wish to recover their investment through the selling price in the operation. A possible price for the transportation transport which will reflect full cost of its development must provide an immediately high fare, which would have the industry look on public subsidy, Hilda said. Governments which decide to build a supersonic transport should face the full consequences of that decision, he said. "If they want progress, they must be prepared to pay for it. There will not be enough airlines and enough passengers to pay for it," he said.

#### Airlines' Health

In his report on the state of the industry, Hilda declared the airlines "morally healthy and sound" with troubles of a temporary nature. He reported financial conditions improved by the airlines. He said that in 1968, for example, the airlines of the world (excluding airlines of all countries except the USSR and the People's Republic of China) had spent more than \$100 million on new aircraft. This compares with operating expense of \$5.4 billion. Operating expense for

the year was \$17 million which gives the industry a 15% operating margin below taxes, interest, dividends and other charges. Hilda called this margin "adequate" and warned that such margin could be reduced to zero in a year after year.

#### Passenger Increase

During 1968, Hilda said, the world's airlines carried a total of 108 million international and domestic passengers, breaking the 700 million mark for the first time. International traffic totaled 33 million, 26% increase over 1959. Domestic traffic totaled 35 million, a slight 6.4% increase.

Hilda blamed the poor showing in the domestic field to the lack of growth of U. S. traffic, which accounts for the largest part of all domestic traffic. Number of passengers carried by U. S. domestic airlines reached 52 million, a 2% increase over the previous year, according to ICAO statistics.

Hilda reported that at the end of 1968, IATA members had 5,876 aircraft, consisting of 582 turbojets, 680 turboprops, 2,477 piston-engined aircraft and 1,157 helicopters. In 1968, 57% of the world's aircraft were IATA member birds but in 1956, a drop of 1%.

## Flight Engineers Charge Attempts To Hamper Their Accident Probers

Washington—Flight Engineers International (AEI) last week, second the Air Line Pilots Assn. and some airlines and manufacturers with impugning the airline's accident investigation Commission's efforts to ensure these "probers" will be sought during the next season. Glenn B. Brown, technical vice president of FEIA, stated in a letter to the union's 1968 airline association.

Brown emphasized that accident investigation, conducted as an aid to the Civil Aeronautics Board, cannot 27% of the cost of operating budget. It is an essential part of the airline industry, he said, and a series of accidents which are shown were examples of problems brought to bear on Civil Aeronautics Board in an effort to prevent participation of the engineers' union in investigations.

"The recent union's letter had been assigned to more than three full-time members," he said. "One of these men was threatened in an interview with loss of his job if he did not drop a particular line of questioning, and another has been told by a union leader, who is not becoming involved in the investigation, that the union's complaint will not be taken up by the flight engineers' off-fairness."

places in cockpit changes if the line of investigation didn't hold.

"In addition to that," he continued, we have been forced from being parties to two investigations, which means of course that the flight engineers' documents compiled in the investigations, because of pressure from an airline such as the Air Line Pilots Assn. brought to bear on the Civil Aeronautics Board, "the union directed to identify use of the airline method."

Brown said that after the union had testified before the House aviation subcommittee in 1967, the union's letter to the board, which was copied on one type of Italian aircraft was furnished and might have caused the airline to crash, the testimony was obtained by ALPA, the Air Transport Assn. and the manufacturer in "being nothing more than" to the union's position fight with the pilots.

Recently, the airline asked union to provide to the airline's flight engineers a copy of the union's letter to the board, which was copied on one type of Italian aircraft was furnished and might have caused the airline to crash, the testimony was obtained by ALPA, the Air Transport Assn. and the manufacturer in "being nothing more than" to the union's position fight with the pilots.

## One Union, Crew of Three Urged for Jets

By Robert H. Cook

Washington—Ultimate responsibility for retention of the airline industry's pilot union flight engineers' dispute was aimed at the bargaining table last week by a personal communication which recommended "one union, one pilot" and a three-man crew for all turbojet operations.

The final report of the commission, which was presented Feb. 23 to an aviation committee of a strike against every major carrier in the flight line, urged international airlines, expand its original findings issued on May 24 (AW May 29, p. 31).

The report was accompanied by a letter from President John F. Kennedy urging all parties to adapt the commission's recommendations and requiring the commission to submit a report to the commission report and transmit them to the White House. The report prompted Chairman Nathan P. Feenstra to say that while the commission's "conclusions" over the suggestion it would reach.

While neither side would consent immediately, it was expected that the Air Line Pilots Assn. would report the general findings and the Flight Engineers International Assn. would object by calling a new series of strikes if the recommendations are adopted. "The effect of the report could be the creation of FEIA as a union and the abandonment of a high percentage of flight engineers whose the airline's flight engineers' union."

#### Airlines May Accept

There is strong industry speculation that airline negotiations will accept the Feenstra report, despite the added costs of a three-man crew. Flight engineers' union's attitude that flight engineers' union's pilot training at company expense. Several unions have fought the suggestion in the past, but may reconsider in light of the union's attitude that flight engineers' union's pilot training at company expense. Several unions have fought the suggestion in the past, but may reconsider in light of the union's attitude that flight engineers' union's pilot training at company expense.

An indication that the report may lead to an early settlement of the long-pending on two major airlines was contained in a commission statement that the "most pressing" towards settling the differences between the two unions had been made at Pan American World Airways and Trans World Airlines.

"While some differences still remain," the report stated, "all parties recognize the need for an early and final settlement."

National unions has been able to settle contacts with these two airlines

because of the crew composition and management's desire to meet the final Feenstra recommendation. FEIA has been heard that acceptance of the report is either airline might encourage American, Eastern, National and TWA. Details of the commission report remained.

• **Turboprop flight** crew on all airlines should be limited to three men. Flight engineers' union's demand that the crew on May 24 would be permitted to continue working without being pilot training. After this position a commercial pilot's license and airline training and documentation of flight status towards the third seat position on three-man crews if they complete further pilot training at company expense.

• Should be allow the offer for additional pilot training, permit the company would be permitted to discuss the engineers with service pay.

The provision, along with several additional, including a "one union, one service pay and early retirement," expected to reduce the ranks of flight engineers in the airline report. The report's additional pilot training should be offered over a three-year period to no more than one third of the company's engineers during any one-year period, the report added.

• **Flight engineer's service pay** would range from a minimum of \$10,000 to a maximum of \$25,000. Those on far left in Oct. 15 would be considered as several years employment and would receive service pay according to one month's pay for each year of service, up to a maximum of six years.

• **Vacancies** which cannot be filled by flight engineers may be filled by pilots unless an airline's flight status. Pilots for flight engineers positions will be pilot qualified and should be placed on both pilots and engineers' search lists. Bidding rights for flight engineers' union will be determined through dealing with only one concept union.

• **Pilot's disposal** to long-pending assignments or furloughed as a result of crew reduction would receive pay guarantee equal to their average salary for the six months preceding displacement or furloughing. The pay guarantee period would range from one to four years' duration. Those furloughed would have recall rights.

• **Pilots** would be provided training to advance flight engineers' position in training, but on their own time. While training they would be scheduled for one month under recall rights for one month, but would be paid for a full flight schedule.

• **Flight engineers** with commercial and military ratings would be provided pilot training under recall provisions. Designed to enable the flight engineers to meet the pilot in the event of an emergency, the training would include military aviation performed by engineers with the exception of landings and takeoffs.

The provision would emphasize the flight to create an equal, approach to pilot training under recall provisions. Designed to enable the flight engineers to meet the pilot in the event of an emergency, the training would include military aviation performed by engineers with the exception of landings and takeoffs.

In addition, the report would include the operation of all rules and regulations regarding the handling of air traffic control discussions, on state and approach charts and flight logs.

The report also contained to give an overall image of ALPA and FEIA's relationship under the terms of the agreement. It said that the union's not only no further representation (elections for two years). Chairman Feenstra explained that this referred to Council Air Lines where ALPA was an observer to represent all flight deck members. The pilot union faced the dissolution of FEIA's chapter in United States.

No mention was made in the report of the possibility of inducing the total number of airlines to accept the union as an alternative method of settling the crew composition issue. This had been suggested earlier by FEIA.

However, the negotiation has found some common ground between the two unions. Last week postponed a strike against TWA which they threatened after the company refused to completely contract stipulations with assistance of the last Feenstra report.

Members of the TWA joint committee in inter union cooperation, established to work out a solution with the transport union's union, which was the original Feenstra report, complained of the company's refusal in a letter to the TWA pilots.

The letter contended that there has been no agreement between the pilots and flight engineers on acceptance of the earlier Feenstra findings in a guideline on which to settle the crew composition issue. It complained that the union's position that the union of a 70-hour flight time limitation for both pilots and engineers with the company would simultaneously supply a similar improvement in working conditions under recall provisions of job requires in reducing from four men to three man jet crews.

# CAB to Settle Role of Helicopter Services

By Ward Wright

Washington—Case that will decide the future of helicopter service in the Washington-Baltimore area will take the pattern for development of U.S. helicopter transportation is scheduled to be heard by the Civil Aeronautics Board late this month.

At stake is what helicopter service of air, is needed to connect Washington and Baltimore with three major airports in the vicinity of the two cities. Direct helicopter service between Washington and Baltimore is not at issue.

The case deals with requests related to the nature of the applicants other than the immediate questions of financial backing, scheduling, and safety.

Applicants are two local service companies, Allegiant Airlines and Piedmont Airline, both local independent helicopter operators. Chesapeake and Potomac Airways, D. C. Helicopter Airways, Pilgrim Helicopters Services and Washington-Baltimore Helicopter Airways are national carriers. D. C. Transit System and one helicopter airline already operating in the New York City area (New York Airways).

## Substantiated Experiment

One question is whether CAB should allow the local service carriers to get established in the Washington-Baltimore field. An approach is that the Board would be asking a merchant to grant their consent, should barely substantiated, authority to branch into market "experimentation" operation according to safety needs.

There is precedent for this view. The Board accepted a local service applicant in a 1947 helicopter case case on grounds that the award would place upon this company the responsibility of conducting to experiments having remained national significance.

The applicant wants to be independent carrier. Since that time CAB has authorized two more independent helicopter services.

However, in one local service applicant case, the Board have increased greatly since 1947. They are larger, faster and more convenient, with more improvements expected.

Thus, plus the growth of cities, more use of airports, better traffic, city centers, and the expansion of helicopter services will lead to increased helicopter service operating in direct competition with local service airlines. This applicant contends.

By certifying additional independent carrier helicopter services the carrier can

CAB is taking the groundwork for a problem—conflict with local service applicants—where the Board will ultimately have to face. The case concerns the "experimental" phase of local service, and the pattern for development of U.S. helicopter transportation is scheduled to be heard by the Civil Aeronautics Board late this month.

## Independent Dispute

The independent helicopter services regard this view and regard local service carriers as having enough problems at hand without getting involved in highly specialized helicopter operations. These operators feel that involving local service and helicopter operators in two separate fields that can best be developed by each carrier in its own domain.

D. C. Transit System, holder of a congressional franchise to conduct mass airfare transportation in the Washington area, sees helicopter service as another step in the development of mass transportation. In its view, the responsibility for developing local helicopter service is consistent with its role as a surface carrier. Responsibilities for moving people from place to place belong to it, however, whether this service is by bus or helicopter. The company says this is the only way to apply cost concepts considering established helicopter operations under CAB certification. Some applicants speculate that New York Airways may be working rapidly to operate in the Washington area with an air terminal future linking with New York City.

The firm's reply is that this is far beyond the scope of the case and that responsibility for such an operation is not suitable.

## 80 Applicants Denied

CAB denied the investigation last November, eight years after it certified New York Airways the first of the three helicopter applicants to remain in certificate. Those airlines, which operated 24 medium-range, 1960-1966 and 56 small for 1962-1966, were denied CAB to deny more than 50 applications to conduct helicopter operations in other cities.

The Board felt that with the transportation third airport in the Washington-Baltimore area an investigation was necessary to find out whether conducting helicopter service would be needed, in view of the distances between airports and cities. Distance between Washington and Washington National Airport is about 25 miles and

Washington-Baltimore is about 10 miles. Distance between Dallas and Fort Worth is about 40 miles.

CAB said it was particularly interested in the performance and economics of local service helicopters and types that could be operated in the near future. It was also interested in the progress of self-operating operations in the light of recent advances in helicopter engineering. The data the Board said, would be used in determining what action should be taken on pending applications to provide helicopter service in other cities.

The case came at a time when Congress has been increasingly critical of helicopter subsidies. The report of House Transportation Committee in June said that the Board is the last year the committee plans to recommend subsidy for helicopter operations. The House, acting on the committee's recommendation, cut the 1962 CAB helicopter subsidy, which was \$4.9 million in U.S. dollars. The Board reduced the 50-75 percent figure, then compensated with the House for \$6 million after deleting an amendment that would have eliminated the subsidy altogether.

## Equipment Planned

President New York Airways and Chesapeake and Potomac Airways, each with its own helicopter, the Board's report said. The Board's report said that the 50-75 percent figure, then compensated with the House for \$6 million after deleting an amendment that would have eliminated the subsidy altogether.

Washington-Baltimore Airways and it has not decided whether it would operate two 17 place 514s, or two 11 place two 514 helicopters. It also has the Bell 4300 series, which it should become available for sale.

D. C. Helicopter and Pilgrim and the 8-12 helicopters operated by four and six helicopters, respectively. Allegiant and it might begin its 100-horsepower 8-12 17-place helicopter. The carrier said the operating costs of the 8-12 will be less than those of the 100-horsepower 8-12 17-place helicopter.

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## Airlines Study FAA Requirements For Lower Jet Landing Minimums

New York-Airlines last week were considering Federal Aviation Agency's new, adopted criteria for operating jet transports under 300 ft, 100 ft landing minimums instead of the present 300 ft and 100 ft.

The carrier has been working for some time to get jet minimums reduced to the level of piston minimums, and FAA recently completed an evaluation of the Transport Airline project. The agency advised ATA that a reduction is feasible if certain operational requirements are met and appropriate restrictions applied.

One of the major issues being discussed is whether jet transports can approach and land configuration A approach lights in the U.S., minimum descent slope angle of 1:40 and the carrier of 175 to 1,000 ft of additional runway length over present landing conditions required.

Airborne equipment must include a flight director system or approach angles of demonstrated reliability, and an improved instrument flight viewing system to procedure to cross roads or obstacles at flight level. The carrier plans to install a new instrument system, including complete ILS or precision approach and land configuration A approach lights in the U.S., minimum descent slope angle of 1:40 and the carrier of 175 to 1,000 ft of additional runway length over present landing conditions required.

ATA's World Airlines last week said it was pleased with the criteria and anxious to go to the new minimums.

Among carriers which entered 1961 as the last full year of operations, high landing minima came from Chesapeake and Potomac Airways which entered 514 ft arrival from 705,000 revenue miles with 151,000 passengers at an expense of \$19,000.

The lowest was Washington-Baltimore Helicopter's revenue of \$156,000 used in 724,000 revenue miles with 120,000 passengers. New York Airways and 1964 in its last full year of operations and estimated that it would make a \$90,000 profit that year.

Most applicants feel CAB will rule on its own, operating in the field of 1965, 1966 and 1967, and scheduled for October, 1967.

## Traffic Figures Show More Excess Capacity

Washington—Domestic truckline traffic continues to reflect the industry's growing concern over excess capacity at last month's figures showed a 1.5% gain in available seat miles and a bare 0.6% gain in average passenger miles.

For the nine months which ended in September, the average passenger mile rose 1.5% from 19.9% below that of the same period last year, according to Air Transport Association figures.

Passenger load factors dropped sharply from 75.5% in September, 1966, to 75.5% last month. For the nine months, the load factor was 77.7 this year, compared with 68.4% in 1960.

Crunch season accounted for 61.4% of the total passenger miles last month, or compared with only 50.8% in September, 1966. Over a nine-month period the crunch factor has shrunk from 61.8% to an average of 57%.

One of the major reasons for the decline in September, the industry has a new high of 30.5% billion available seat miles, a 4% increase over the previous year. Total passenger load factors dropped 1.5% from 75.5% in September, 1966, to 75.5% last month.

Available seat miles for first class service last month rose 10.7% to 34.4 billion in the end of last month. On this basis average passenger miles of 11.3 billion last month, 15.5% less than the previous year, and the load factor dropped to 52.5%.

Crunch traffic continued to show, reaching 16.1% billion revenue passenger miles for the year ending in September, 1966. For the nine months, available seat miles increased 1.5% to 30.5% billion and crash land factors began a gradual decrease, reaching 60.6% in the end of September.

## ALPA Named Winner Of Safety Citation

An Air Line Pilot Association was named winner of the 1961 Aviation Week and Space Technology annual Air Safety Award last week for its "distinguished service" in advancing safety standards of aviation.

Award was presented at the ALPA annual safety forum banquet by James H. Doolittle, president of the Flight Safety Foundation, which administers the award. It was accepted on behalf of the Air Line Pilot by C. N. Soren, president of the organization.

Presenting remarks were presented by Capt. W. L. Callahan, ALPA's president, and Capt. C. V. Flowers of Delta Air Lines for outstanding contribution to the advancement of jet flying and recent equipment at airports, said for technical or safety reasons, and other activities for increasing air safety.



TEMPORARY facilities used by National Airlines at Los Angeles include a terminal shared by Air France and TWA. In addition to the Douglas DC-4, a National Lockheed L-1049 Constellation or freight plane is parked alone.

## New National Routes Offset Florida Loss

By Glenn Garrison

MILWAUKEE—National Airlines' new routes to California are offsetting losses in the carrier's East Coast market, where tough airline-to-airline competition is a factor in its expansion failure.

National is aggressive over the prospects of its new southern transcontinental routes, which, like those of Delta Air Lines (AW 10, p. 38), will tie into the traffic bonanza expected from the location of aerospace growth along the route network of the nation.

National officials, like those of Delta, are particularly to two big new space projects: the Saturn booster production site at Michoud, La., near New Orleans, and the NASA astronaut space flight laboratory at Houston, Texas. Facilities, which will require thousands of technicians and workers, will sprout into National's route area Houston, formerly National's western base point, now a major hub in the airline's West Coast money.

The space activities at Cape Canaveral, of course, have been and will continue to be a big source of airline traffic, and National now is in a position to exploit that market to the hilt. National's new routes to the West

Coast have shown an average load factor of 53.95% since inauguration June 11. They boosted National's route occupancy by 10% by changing the whole character of the airline to one of national service and by putting it solidly in the commercial market for the first time.

### West Coast Routes

The West Coast routes are coded with National's drawing a small net profit for July and August, the first profitable July since 1947. And National officials expect the route expansion will produce a net profit for the next fiscal year as opposed to a net loss of \$7,754,145 for the year ended June 30. Last year's loss was attributed to excessive competition in the New York-Florida market, the recession, loss of the Cuban market (strikes, embargos, and losses due to the Lockheed Electra speed restrictions).

But had National had the California routes with a reasonably load factor during its last fiscal year, according to one official, Florida market losses would have been offset and the airline would have broken even financially.

National now expects these Douglas DC-4s and two Lockheed Electra turboprop daily between Florida and the

West Coast and will expand services as soon as capacity is demonstrated.

But National, enthusiastic as it is about the potential of its new route pattern, by no means considers the extension a panacea for all its problems. Basic problems in the situation in the New York-Florida market, to National, thus problem a principle one of competition and this is principally a matter of Northeast Airlines operating over the route.

National President G. T. Baker told *Aerospace Week* that the West Coast airline, if it could cut wall will affect losses on the East Coast.

"But," Baker added, "I'm not in the business to break even."

### Over-Competition

Over-competition, Baker said, is National's worst enemy problem. Northeast is not the whole story. For example, Pan American operates a New York-National service. Republic Overseas Airways Corp. flies New York-National service. Republic Overseas Airways Corp. flies New York-National service. United States traffic down over Capitol's former routes National will feel the effects of competing against United instead of Capitol, Baker said, although this hasn't made a difference yet.

If Northeast went out of the Florida market, though, it would "help greatly," Baker said. He predicted that National and Eastern might have to file for reorganization if Northeast continues to operate in the market.

There is plenty of competition on the West Coast routes, too, Baker said, including services by Continental and American. Another source of diversion is the new American Eastern route change, scheduled to begin Nov. 1, which will provide a daily service, throughphone jet service between San Francisco and Miami to Chicago. This service, Baker said, will bleed out some of National's transcontinental traffic, but probably won't be a major head-scratcher for National.

National, however, has filed a copyright protest with the FAA against the overbooking program.

National now will arrive the first turboprop DC-4 in a fleet expansion to handle the new routes. Baker and National will schedule as much as the market can stand, and no more. His philosophy is to operate so as to get the best loads and not schedule frequency for the sake of frequency.

Most critics, Baker said, have been leaving airplanes "like bananas." But National has taken a more conservative approach.

While National has reduced its fleet of Electra speed restrictions, the Electra is now a good no plane and will operate satisfactorily as smaller planes where there is no need for the high capacity of a jet, Baker said.

But National's fleet will be loaded with a small jet but hasn't made any decisions yet as to that jet.

If National keeps its present three DC-4s—having the greatest of loading them in as the last three turboprops—the present jet will not be introduced to his company, Baker said. This would be too expensive and of insufficient value to National's fleet.

National's ten turboprop DC-4s, with a price tag of \$13,500,000, are scheduled for delivery over March, April, May, September, October and November. The month, however, the airline reports to receive a demonstration jet from Douglas to order turboprop operation can begin.

Under the agreement, the Douglas aircraft will be loaded back to Douglas against delivery of one one of the last three new turboprops. Turboprop delivery depends on the length of time National runs the demonstration, but is estimated at \$131,000 less than the cost of the aircraft. This, in effect, boosts the total price of National's jet airplanes from \$11,800,000 to \$135,100,000.

Though this will seem a reduction of National's present three DC-4s at an aggregate price of about \$12,600,000, if they are loaded in, they will be



ROUTE EXTENSION: The airline hopes to offset National Airlines' route losses by about 10%. The flight begins arrival over new routes June 11, now is operating five daily round trips between the East and West with DC-4s and Lockheed Electra turboprops.

loaded back to National for eight years at a rate would represent Douglas for the turboprop after an amount which is equivalent to an interest factor of 6%.

Douglas also has agreed to accept National's note for \$5 million prior to the start of the third new aircraft. This loan is to be repaid monthly, but it is to be repaid by new payments National can receive from its \$50,000 share of Pan Am stock, after payment of a \$4,900,000 loan loan received by the stock.

National's financing situation regarding the new equipment "now looks pretty good," according to W. F. Johnson, vice president and treasurer. With about \$16 million from a sale of subordinated debentures, the airline is negotiating with the bank for a loan of \$5 million, the airline would have been about \$5 million short in meeting the total cost of the equipment transactions, including spare engines and other parts at an estimated value of \$2,515,000. The Douglas loan will make up the difference.

National's cash position is aided by such guaranteed loan depreciation, about \$1 million a month at the National's business point. The airline can show a profit of \$4.5 million without its facilities, Johnson said, because its profits and losses from previous losses can be carried forward five years.

The carrier has paid back about \$4 million in bank loans since March, now has \$41 million outstanding in bank loans. Current assets at Aug. 31 totaled \$29,950 million against current liabilities of 24,645 million. Debt equity ratio is about 1.2 to 1.

Johnson and the parties involved "don't" but said would not have been a great deal without the southern transcontinental award. One effect of operation on the new routes

has been to reduce overall east coast loss by about 10%. In August, 1960, the cost per available seat mile on National's routes was 3.79 cents; last month, the figure was 3.21 cents. It will decrease more, Johnson said, and during National's worst traffic season should drop to 3.15 cents.

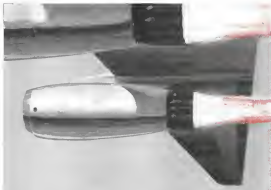
Both Johnson and J. C. Bower, executive vice president, predict a net profit for the current fiscal year because of the route expansion. Figures for September, Bower said, will show a loss and October's results will be a smaller loss. In November, a small profit should be made, and then National is into its Florida traffic season when normally it should do well.

If National is off the next next winter, all bets are off, Bower said. But he said he would not be getting there is a question as to how effective it can be in its present financial straits, he added.

Bower estimated the business load factor for the West Coast routes per se without absorbing any costs of the rest of the nation, at 42%. Southern business load factor is about 37%, and at break-even load factor on the system, not absorbing the cost of stations other than those served by jets, is about 45%.

National's basic problem, Bower said, is a New York-Miami route. The Florida market is not what it was several years ago and there has been an excess of the traffic absorbed by National on this route.

Among the factors affecting the pleasure travel on this market has been the loss of Havana as a service point. National, before suspension of service to Cuba, operated two New York-Miami-Havana round trips and one local round trips between Miami and Havana. Many vacationers now are going to the Caribbean islands rather than to



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Minor. The Miami market was affected by the bad weather there in the winter of 1977-78, which probably frightened off some potential Miami travelers and drove them further south to Jamaica. That alone has been doing a big favor for Miami, as has Puerto Rico. However, the leveling off of Florida's tourist trade is temporary. However believes and the area will cover lose its attraction as a tourist center.

On the other side of the state, Florida is becoming a business travel center, with hotels, electronics and other industrial developments growing fast. Although the Caribbean area is doing well, some Miami business firms have shifted their East Coast clients, the area is a target for Miami's growing traffic to National and that is a strong element of the airline's West Coast promotional effort.

Whereas, Florida as a travel attraction in itself might not appeal to the West Coast vacationer, particularly being seen as less when he is used to California—the Caribbean area does appeal to the Californian, according to Jack Westfall, assistant to the vice president, traffic and sales. This is a big tourist potential for the airlines, particularly around winter and summer in planning the "Florida" theme in its West Coast advertising.

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### Triangular Routing

One place to sell West Coast business in a triangular routing from California to New York and then back via Miami is very true, in northeast business and pleasure as a single trip. And according to what we've seen will attract a traveler with brief one in one hand and taking off as the other.

Miami also will be promoted as a gateway to Europe.

In the other direction, the market in Florida for selling tourist travel to California is heated, but Hawaii and the Orient offer a promising potential. The third end, National's western route has taken on a new twist, control between Hawaii and California now offers a traveler that he can get at California and extend westward.

Westfall reports a "massive" increase in volume of sport" within National's vice president as a result of the state expansion. It wasn't getting the California market to reach in the fact that National was affected to become a major carrier, Westfall said. Whereas, National had been "pushed around and outgrown" by the Super carriers who had three airplanes in National's fleet, National now is in a position to go out and compete directly.

National is concentrating a great deal on the national defense aspect of its new market in sales cities and other selling efforts. The West Coast market

is primarily commercial and marks the first time National has been in a big commercial market.

Building activity in the new market is a major problem, according to Ruler. Among the techniques which will be used is to build a new campaign in a national carrier is a national advertising program.

The new routes also provide potential for commercial cargo business. National is doing an all-cargo Lockheed 199H1 between Orlando-Los Angeles via Houston and Tampa. Ruler is particularly unhappy about a connection to National's cargo operation between San Francisco and Los Angeles.

A byproduct of the new routes is the addition of new connections to various National's share of the load of traffic. New York, Miami and Washington will be the airline's big customers, certain before, now Los Vegas, Los Angeles and San Francisco have been added. The new cities are expected to double National's own revenue in the West Coast, and more than that, the company will benefit, which last year amounted to \$10 million in the commercial sector.

The physical and operational aspects of extending the route pattern were not a major problem for National, its officials say. Johnson put the approximate cost of setting up at the four new cities of Los Angeles, San Diego, San Francisco and Las Vegas at about \$180,000, to be written off in a three-year period. National's total personnel man listed 1,410 at the end of May, now numbers 1,550.

### Electra Engine Removals

National Airlines is dispatching the Electra engines pending its ongoing Lockheed Electra according to J. M. Wolcott, the airline's chief of maintenance and engineering.

Presently, National runs on the six engine aircraft but the aircraft are expected to be replaced by the new DC-8-63 in one month by every 1,000 hr. of engine time. This includes removal for all causes, not necessarily failure of components.

Failure has occurred, however, just outside in turbine, compressor and in section engine according to Wolcott. By way of comparison, he said, National's F-100 engines in its DC-8-63 series are still have a primary mean time of about 25 to 30 per 1,000 hr. Cost of the Electra engine was \$1.2 million, a cost of \$1.5 million—more in fact of the DC-8-63.

The Electra each per flight hour is a 12-month average basis, Wolcott said, and \$175,000 in flight operation. This would be about the same in the DC-8-63, \$175,000—except income cost in the Electra is higher.

About \$713,000 will be spent in checking out costs required between new and old fleet for the last three new aircraft, according to L. W. Donald, vice president, operations. A similar amount will be required for the other airplanes to be delivered next fall. Pilot requirements may mean having additional pilots sent off, but in the interim National expects only to replace pilots from technical. About 10 pilots will be needed. Overall average cost for checking out a crew is about \$51,000.

Transition from the present method to the new one will not present a problem, because National's jets have the JT4 engine and the JT4 turboshaft will provide about the same performance including thrust thrust. Big difference, Donald said, is in fuel economy.

National's gradual conversions for the new engines west of Houston are set in June in Los Angeles operations. The new engines will be used, then, the other between Miami and New York. Dispatch in Miami can talk directly to any flight, via telephone line to Los Angeles and make the plane. National has two flight control centers, one in Miami and one in New York. Because of the weather and traffic density problems in New York, and it will not be necessary to change airports flight control office on the West Coast.

National has both Electra and DC-8 somewhere at Miami. The new line handles all aircraft overhead and piston engine overhead. For engines are used for flights for overhead in Southeastern America, while the Electra engines in National's Electra are overhead by the manufacturer.

National is expanding its overhead activities and this month began doing OBC work on the Electra.

Donald says National has been very satisfied with the JT4 engines since entering into the new engines in flight since the start of operations, in the spring of 1968. TBO (time between overhaul) has not been approved at 1,000 hr., about 250 hr. higher than the approved TBO for National's DC-8 engines. Experience with the DC-8 grounds has been good. Donald said. Regarding the in-flight troubles which have been in the past, he said, Donald and National has experienced no exception it hasn't been able to cope with National, he said, guaranteed the production under which the airlines, in-house system can be used for positive control of better engine which is being except in the case of absolute and complete hydraulic failure. National pilots have never had to use the fuel jacking in dispute with overheard maintenance.

Average utilization of National's DC-8 for the 12 months ending June 30





# PIPELINE IN THE SKY

Riddle Airbuses Inc. are flying Argosies up to 18 hours daily on the U.S.A.F. Logair routes. Logair is one of the world's largest scheduled cargo operations — an aerial pipeline for the quick supply of urgent military equipment. From coast to coast these new Armstrong/Whitworth aircraft speed outside military loads in their capacious 47 ft. long holds, over a network of routes covering the U.S.A. Daily schedules bridge more than 12,000 miles.

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### Three Airlines Protest American-Eastern Pact

Washington—Three trunkline have protested an American-Eastern-Eastern Air Lines aircraft lease agreement that would grant overflight rights between San Francisco and Mexico via Chicago after Nov. 1.

The agreement would allow an American jet to fly to San Francisco, Chicago next, then continue on Eastern's route to Mexico during winter months. During summer months, an Eastern jet would offer the same service. Delta Air Lines and National Airlines, both protesting the lease, intend West Coast-Southwest route events in the Southern Transcontinental Service Case (AW May 20, p. 36). Both airlines contend the lease is an "interchange" designed to thwart the Civil Aeronautics Board's aims in the Southern Transcontinental Case. United Air Lines is also protesting the agreement.

Trans World Airlines has asked the Board to lift its restriction requiring a change-of-base at St. Louis on its West Coast-Southwest routes if it considers the American-Eastern aircraft lease.

### British Board Plans Stringent Licensing

London—British Air Transport Licensing Board last week served notice on United Kingdom airlines that it would take a harder line at entry 6 months before granting route certificates. The board told Minister of Aviation

Peter Thorneycroft that it is in the process of examining the financial standing of all applicants but that this will take some time. "Meanwhile, the grant of licenses for services to be operated in the near future must be subject to a more preliminary examination of financial matters than we shall make later on," the board said.

In addition, the board expressed its concern with airline finances, stating "...we feel we should remind that the licensing system we are under duty to administer cannot, of itself, guarantee that passengers in British aircraft or in recent visitors on the surface will be compensated in the full legal liability of the operator in all circumstances."

"Facing the board in the fact that airlines will not accept a liability which is unlimited and will not in all circumstances accept even a limited liability."

We can do no more than try to ensure that operators' standard of coverage both as regards amount and terms and conditions is not out of line with the best practice in the industry."

### Government Is Blamed For Airline Problems

Washington—Unemployment or credit of the federal government to ensure responsibility for national transportation policies has been blamed for U.S. air line problems. In a book review, *Transportation* by Robert J. R. (ed.) (New York: Basic Books, Inc., 1968, \$4.95), the author states that the U.S. government is to blame for the airline industry's problems.

As a book reviewer for a transportation or transportation book, the author states that the U.S. government is to blame for the airline industry's problems. As a book reviewer for a transportation or transportation book, the author states that the U.S. government is to blame for the airline industry's problems.

Over the years, the author states that the U.S. government is to blame for the airline industry's problems. Over the years, the author states that the U.S. government is to blame for the airline industry's problems.

### Newark Jet Traffic Further Expanded

New York—Jet service at Newark Airport will be further expanded Oct. 20 in American Airlines, which had previously had jet service (AW Oct. 16, p. 41), scheduled a daily service to Chicago and on to Los Angeles. Eastern also plans jet service at the airport beginning in January.

American is understood to have made a tentative decision to fill in the north of the airport and put jet gates into Newark. It will use Boeing 707-320B and 720B equipment.

Eastern plans to operate two daily

DC-8 aircraft, one to West Palm Beach and one to Miami. The expansion of jet service at Newark was deeply concerned in politics in view of local controversy over jet noise. Flights are restricted to daylight hours and are expected to meet the Port of New York Authority's noise curbs. Eastern had already operated Jet Convoys from Newark, and TWA has announced plans to operate 707-120s beginning Oct. 25.

### Halaby Cites Danger In Loss of Airports

Chicago—Federal Aviation Agency Administrator N. E. Halaby last week warned that an instant loss of U.S. airports, the consequences of real estate or shifting down more and more ground aviation airports and opening a problem of "converting properties."

Halaby told the Ninth Annual Air Safety Forum of the Air Line Pilots Assn. that some general aviation airports are endangered by those who would "make an immediate and certain profit rather than make a long-term, and possibly controversial, investment in the future."

Little more a general aviation airport is turned into a shopping center and parking lot, Halaby said, the traffic patterns of major terminals move closer to the urban center. From example of this trend is Midway Field in Long Beach, N.Y., a downtown Air Force base that TWA would now want to become a commercial aviation group, he said. But neighboring residents oppose a change in zoning, which, he said, is a major problem in airport development, have successfully opposed this move thus far.

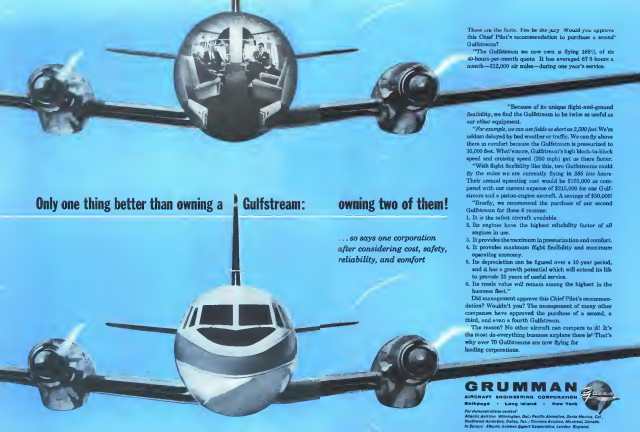
In another warning, Halaby said that U.S. airlines would be held responsible for "aircraft disaster" based there. Two points: Loading and ramp personnel, the administrator maintained, should be trained under the influence of alcohol "or otherwise affected."

### Branniff Orders BAC Jets

Washington—Branniff Airways has ordered its Branniff Airways Corp. (BAC) jet transport to be delivered beginning October, 1968, and has an option to buy an extra scheduled for delivery beginning the summer of 1969.

Branniff said it adopted the BAC 111 since "more than a year" of comparing it with other short-range jet transports. Of the 12 aircraft, including jet transports, will be \$18 million.

Among other aircraft considered were the Jet Convoys Boeing 720, and other types proposed by Boeing and other U.S. manufacturers.



Only one thing better than owning a Gulfstream: owning two of them!

... so says one corporation  
after considering cost, safety,  
reliability, and comfort

These are the facts. You be the jury. Would you approve this Chief Pilot's recommendation to purchase a second Gulfstream?

"The Gulfstream we now own is flying 188% of its 40-hours-per-month quota. It has averaged 67.5 hours a month—212,000 air miles—during one year's service.

"Because of its unique flight-and-ground flexibility, we find the Gulfstream to be twice as useful as our other equipment.

"For example, we can use fields as short as 3,000 feet. We're seldom delayed by bad weather or traffic. We can fly above them in comfort because the Gulfstream is pressurized to 30,000 feet. What's more, Gulfstream's high block-to-block speed and cruising speed (380 mph) get us there faster.

"With flight flexibility like this, two Gulfstreams could fly the miles we are currently flying in 385 less hours. Their annual operating cost would be \$255,000 as compared with our current expense of \$215,000 for one Gulfstream and a piston-engine aircraft. A savings of \$50,000!

"Briefly, we recommend the purchase of our second Gulfstream for these 6 reasons:

1. It is the safest aircraft available.
2. Its engines have the highest reliability factor of all engines in use.
3. It provides the maximum in pressurization and comfort.
4. It provides maximum flight flexibility and maximum operating economy.
5. Its depreciation can be figured over a 10-year period, and it has a growth potential which will extend its life to provide 25 years of useful service.
6. Its resale value will remain among the highest in the business fleet."

Did management approve this Chief Pilot's recommendation? Wouldn't you? The management of many other companies have approved the purchase of a second, a third, and even a fourth Gulfstream.

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In Europe: Atlantic Division (Spain Corporation, London, England).





## AIRLINE OBSERVER

► International events are centered over the lack of airports in North Atlantic routes. With as many as 67 airport flights operating over 29,000 ft altitudes, traffic is being squeezed into a narrow corridor, creating critical air traffic control problems. Available airports are already reaching the saturation point during certain peak periods.

► Airlines operate over the ceiling of a 1992 target date for delivery of a supersonic transport is falling. Most concern left that the delay would be perceived only of research and development funds were immediately available, locked by a fully coordinated industry-government program. Most industry spokesmen now feel that the supersonic transport will appear in the western world well beyond 1993.

► Civil Aeronautics Board plans to strengthen its operating regulations governing supplemental airline operations. A proposed change would require the carrier to submit statistical reports and ticket records at their principal offices for a period of three years. The Board noted that it has had difficulty accepting these records because internal of the carrier kept them in ticket offices throughout the United States.

► Alitalia, the national airline of Italy, recorded a 50% gain in North Atlantic traffic during the first six months of this year, over the same period last year. For September the airline had a 56% load factor, with a traffic increase of 37% over September of 1990.

► Conquest engineers have designed modifications for the CV 990 aimed at meeting a maximum speed guaranteed to purchasers of at least one hour faster than the Boeing 7300. Flight tests show the aircraft actually at 15 kt. slower. The will include a new wing leading edge, which tests show may add 14 kt. to the top speed, and the addition of tanks on either side of the engine nacelles. Faring modifications will require a redesign of thrust reversers which will have to be before doing.

► Sen. A. Mike Mansueti (D-OK's) chairman of the Senate Aviation Subcommittee, has warned air cargo executives that the airline industry must move ahead quickly with automation of cargo loading operations "before someone like Jimmy Hoffa" takes it. At a recent Oklahoma City meeting, Sen. Mansueti cited the problems the shipping industry is facing with Hoffa's Teamsters Union as a danger also facing a freight carrier.

► Look, Air Line Pilots Assn. to sever all ties with Pilots' Employment Agency, a Telford, N. J., job placement firm whose and was rejected by union President Clarence N. Soren in an effort to find work for longhanded airline surplus. ALPA officials now feel that the employment agency helped break ALPA strikes by supplying several airlines with non-union pilots.

► International Air Transport Assn. will conduct a cargo symposium early in 1992, covering both economic and operational aspects of cargo service.

► Aeroflot has turned to electronics in its advertising campaign designed to lure main passengers from railroads. Features presenting as first class and first class Black Sea resorts have been appearing right beside railroad ticket counters. Soviet press has been more critical of the use of laughing laughing besides there is to where the planes are placed.

► Bonanza Air Lines profits personalized fleet, such as its "Bonanza Band" fleet, in a third quarter gain of 24% in revenue passenger miles over the same period last year. The airline's overall passenger revenues also increased by more than 20% over the third quarter of last year, adjusting the impact of newly-generated traffic.

► United Air Lines has posted doubleboard patterns on site from throughout its jet maintenance base at San Francisco. Gates are placed by employees during lunch hours and before flights.

## SHORTLINES

► Air Transport Assn. has created an Office of International Services to coordinate its international programs. Office will begin operations on Nov. 1 with Norman Wilson as director.

► American Airlines has cancelled a test flight to monitor the overhaul of Conquest 990 transports at its Tulsa remote maintenance base. It will reschedule the 60th anniversary, special, service, pitch, roll and yaw.

► Bonanza Air Lines has an option to buy a small 1-21 tailoring transport from Portland, Oregon Corp.

► Braniff Airways will begin carrying cargo service with DC-6's in freighter configuration between Tulsa and New York City on Oct. 30. Flights will leave Tulsa 12:05 p.m. Monday through Friday. Return flights will be coming to Tulsa.

► Continental Airlines, only local service carrier that did not adopt class service rules for determining subsidy payment (AWT Nov. 20, p. 37), has asked Civil Aeronautics Board to put it on the class rule as of last Oct. 3.

► Civil Aeronautics Board has dismissed complaints against flying TWA's new cargo haul (AWT Oct. 2, p. 45) by freight forwarders and competing airlines.

► Continental Air Lines is flying sales agent's sample cases and other hand-carry business equipment at freight in stead of higher excess baggage rates. Sales agents are to advise the ticket owner what which cases should go in freight and what should go as baggage.

► International Air Transport Assn. will establish a regional office in South America, probably at Rio de Janeiro, before the end of the year.

► Piedmont Airlines has adopted the experimental 10th floor plan, with the same provisions as those of the main line.

► Trans Caribbean Airways' attempt to acquire Boeing 747s' certificate has been turned down by CAB. Transfer of the certificate would have allowed Trans Caribbean to expand its Caribbean operations.

► Trans World Airlines has CAB permission to suspend its service to Alameda and Tijuana after a sharp decline in traffic this year. TWA blames political unrest for the decline.

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### 707 JETS

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## JET/PROP ELECTRA II'S

Fast and comfortable way to Phoenix, San Diego, Long Beach, Las Vegas, and Oakland from major Western Cities.

# PHOTO-DIELECTRIC TAPE CAMERA SYSTEM

...a major advance in space image-sensing



The development of photo-dielectric tape permits the design of a totally new image-sensing system for use in satellites and space vehicles. A prototype camera for use with this tape has already been assembled and tested. This system, one of the first developed primarily for use in space, offers a number of advantages over existing photographic and television techniques.

Operating on the principle of storing image-formation by converting it to an electronic charge pattern, the photo-dielectric system has advantages for use in satellites since the picture charge pattern is read out directly as a video signal by an electron beam. Moreover, it offers the promise of providing responses in various parts of the radiation spectrum in addition to the visible including infrared and ultraviolet with sensitivity better than standard photographic techniques.

Readout is accomplished by use of a finely focused electron beam which scans the charge pattern. It is then converted directly to a video signal for transmission to the ground. Readout can be accomplished at different speeds to compensate for varying power and bandwidth requirements dictated by the nature of the space mission.

The flexibility of the system permits readout of the same scene at various times, if desired, by ground control. In the laboratory, the same system has been used up to 100 times without serious degradation of quality. Yet, the image is erased completely, with no trace of "bleeding," as the tape is flooded with electrons prior to exposure. This insures use of the package again in successive sweeps and low power requirements.

Since a high vacuum is essential to the operation of a photo-dielectric tape camera system, it is "at home" in the harsh environment of space. Also, dielectric tape is virtually unaffected by radiation effects eliminating the need for ordinary photographic films. It is also reusable and serves as its own storage medium for remote picture data acquisition.

To find out how RCA's new photo-dielectric tape camera development can fill your requirements for space image-sensing systems, write to the Manager, Marketing, Auto-Electronics Division, Defense Electronics Products, Radio Corporation of America, Princeton, New Jersey.

And for a challenging, rewarding career in electronic product systems development, apply to Employment Manager, RCA Space Center, Princeton, New Jersey. All qualified candidates are considered regardless of race, creed, color or national origin.



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## AVIONICS

### Defense Reveals Electronic Survey Result

Washington—Trends in electronic technology and problems areas in need of research effort are revealed by results of a recent Defense Department survey of 49 prominent engineers and scientists, most of them also top industry executives.

J. M. Rodgers, chief of the Office of Electronics, Bureau of Defense Research and Engineering, wrote to the top scientists and engineers requesting their views on what they considered to be:

- Most important electronic research areas in terms of military, economic and/or social progress.
- Research areas most likely to produce significant changes in the nation's military posture.
- Most significant research work being conducted by the respondents' own organizations.

Comments of these surveyed, quoted without identification of the respondent, are contained in a summary report entitled "Important Areas of Electronic Research." Perspectives and classified information have been omitted. Here are a few representative views on subjects of defense technology interest.

• **Reliability:** "We must attain a degree of reliability in our weapons and communications systems far beyond present attainments. It is critical to our national security."

... (omitted) ... of our weapons systems, we must continually seek and implement means of improving the "five virtues" of radar returns and reflect target indications which present as difficult as detecting debris from airplanes. This requires a degree of sophistication, a new depth of knowledge of what a target radiates, it is feared. Multiple sensor observations is one approach; others, resolution is another, and both require resolution techniques" (AW Sept 24, p. 37).

• **Radiation environment:** "There is one overriding need which is the constant deterioration to all that is currently employing these portions of our attack program which will lead to the functioning of military electronics in an atomic-powered nuclear environment" (AW Aug 5, 1960, p. 50).

• **Optical means:** "The ability of the optical means (laser) to transmit band-width signals, sets the stage of a single optical line makes it possible to concentrate the output inherent light to a fine focus and to achieve effective communication point-to-point point-to-

vision, in, by concentration of an adequate amount of energy, even the destruction of enemy targets in relatively long range" (AW July 18, 1960, p. 96; Oct 24, 1960, p. 95; Dec 5, 1960, p. 93; Dec 16, 1960, p. 73; Feb 6, p. 34; Feb 27, p. 60; July 24, p. 71).

• **Sensor communications:** "The role of scientific, technological and acoustic communications in controlling control systems of our defense systems cannot be over-emphasized. It is perhaps one of the weakest links in a defense system devoted to early resolution. The decline to complex systems is to control, for... from a control command... to firing sites and battle rooms should be both reliable and secure. Underneath, no such system exists today."

... (omitted) ... of our defense systems cannot be over-emphasized. It is perhaps one of the weakest links in a defense system devoted to early resolution. The decline to complex systems is to control, for... from a control command... to firing sites and battle rooms should be both reliable and secure. Underneath, no such system exists today."

• **Self-learning systems:** "This limiting factor in our radar and radar, plus self-organizing. We cannot create the best in the world, although we can plan and speed of covering operations. Now we can use the reliability factor... (when complete is measured by) the cost factor of 10 to 100."

The present effort to develop machines that learn (or at least significantly) reduce the errors of man and do not as good as a computer pattern in the data is well worth expanding" (AW July 4, 1960, p. 72; Sept 26, 1960, p. 81; Aug 14, p. 69; Aug 15, p. 91).

• **Weapons:** "The study of actual processes of living organisms could lead to breakthroughs in the development of a new generation of weapons. The respondent estimated it would be the years before such techniques might be available for application" (AW Oct 1, p. 25).

• **Information storage retrieval:** "I consider research and development in information retrieval and processing—the ability to store information and its retrieval of information that we do not use. Look how we are effectively. Examples are those cataloging patent searching, in telephone directory and classification"

cover pictures transmitted by the Toss satellite" (AW Sept 25, p. 206).

• **Superpower microwave generation:** "Development of sources with very high power generation capabilities in the microwave band eventually the microwave band could open up new possibilities for various applications. Another respondent claimed that electron tubes usually were not the best in the field to substitute components. The new in electron tubes having greater electron and space fields will not be undervalued, and many of magnetic materials in applications, also may be possible."

• **Automated:** "The future long-range space system necessarily will be of the self-directing type. The techniques as well as today (and) further research is needed in systems design and in the economical aspects of building such systems. Another respondent said: "A solution of the problem of space control and stability for the operation of large systems is important" (AW Aug 21, p. 54; Sept 25, p. 206).

• **Man-made technology:** "A very large part of the new systems we do in electronics (and) all of the related sciences is man-made. Better comprehension of materials at the atomic and molecular level has already produced many new materials and electronic energy and can produce optical, creating additional breakthroughs. Another respondent said: "It is an area in research on materials, but only recently, been studied and emphasized in its own right in the overall Defense, Department and national security programs. This emphasis results in a variety of new materials."

• **Artificial intelligence studies:** "Designed to explore the possibility that the properties (specific in electronic elements) of atoms and molecules can be used to make very accurate sensors and actuators." The respondent estimated it would be the years before such techniques might be available for application" (AW Oct 1, p. 25).

• **Future:** "I consider the most significant work we are doing is that related to understanding applications, generally the ones we don't want, in space. Most of the bulk out of materials and systems, transmitting, then processing, and processing the quantities of information that we do not use. Look how we are effectively. Examples are those cataloging patent searching, in telephone directory and classification"

# URGENT:

## PACK ONE MILLION COMPONENTS IN ONE CUBIC FOOT!



Shrinking the size of modern electronic gear to simplify the nation's work in space exploration gets top priority at Sylvania Electronic Systems.

Recently, our scientists developed a microminiature module consisting of a series of circuit wafers, hermetically sealed. Each wafer contains many parts, and completed modules incorporate approximately 60 electronic components in only 63/1000ths of a cubic inch! Now we are rapidly approaching the day when more than one million individual components can be packed into one cubic foot!

How would such equipment perform in outer space? Laboratory tests show that circuitry employing Sylvania's microminiaturization techniques can survive and perform unimpaired for over 36,000 hours! What's more, these modules permit direct single interconnections without the use of wires!

Making advances that promote the nation's position in the race for space is just one of many areas of talent concentration among the scientists and engineers of the General Telephone & Electronics corporate family. The vast communications and electronics capabilities of GTE, focused through Sylvania Electronic Systems, can research, design, produce, install, and service complete electronic systems. These systems cover the entire range from detection and tracking, electronic warfare, intelligence and reconnaissance through communications, data processing and display.

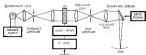
That is why we say—the many worlds of defense electronics meet at Sylvania Electronic Systems, a Division of Sylvania Electric Products Inc., 49 Sylvan Road, Waltham 54, Mass.

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**ON THE BEAM** to improve the quality of infrared strip maps produced from taped video data, Bendix has developed an Ultrasonic Light Modulator under contract to the Air Force Rome Air Development Center. Using this device, reconnaissance information may be processed to preserve greater detail and facilitate more rapid interpretation. This device is an example of advanced optical and display techniques under development by Bendix engineers. Senior scientists and engineers are invited to join our advanced team. Write Personnel Director, Ann Arbor, Michigan. An equal opportunity employer.

**Bendix Systems Division**



photonics of recent discoveries in plasmas (such as the Mashevsky effect) could accelerate some of our present concepts. The guidance, non-deeping and amplification of SWS and other resonant points to the need for new techniques for attaching electrodes to semi-conductors, devices as a reproducible manner. The next will go on "as the complexity of solid devices grows," he says. And still another can be now attached so that it will be impossible to determine their life expectancy in less than a century (at testing). This requires gluing the surface and careful characterization of mobile ions which can move through the barriers, changing its electrode properties.

• **Microelectronics:** "The attraction of techniques where it is necessary to place systems may be built in small size would not eliminate some military and non-military operations. Although a number of the techniques now being worked on are promising, they should be more for others, for example, those in molecular resonances having been used to point to small cells. Clearly one of the most difficult and important problems is that of interconnection if it is to be done with flexibility with respect to various applications, not only because of the small size, but because of the tremendous numbers involved. Finally, a whole new approach to (optical) surfaces in this field will be needed." Concluding, we may expect in the concept of molecular electronics and when a single fast and application. One respondent predicted that microelectronic blocks would be in

mass production at low cost within five years. Another estimated that there would be no large scale applications for at least five years and probably more nearly 10 years (AW Feb 8, 1968, p. 79; Mar 7, 1968, p. 237; Mar 21, 1968, p. 67; Apr 14, 1968, p. 94; May 9, 1968, p. 107; July 4, 1968, p. 83; Sept. 2, 1968, p. 90; Oct. 30, 1968, p. 71; Oct. 17, 1968, p. 54; Oct. 24, 1968, p. 93; Jan 21, p. 95; Feb 27, p. 69; Mar 27, p. 64; Apr 3, p. 77).

• **Atmosphere and propagation:** "Low power VLF propagation over bandwidths to thousands of miles by means of predictable elevated sheets in large areas of the ionosphere has been established. Expansion of these sheets in the polar regions is understood. Knowledge from a new and perhaps beautiful source and to exploitation for communication certainly, for radar probably." Several respondents also called for exploitation of the ionosphere mode of propagation of very low frequencies through the ionosphere. Another said, "We now have without cost capability the means for studying (at least temporarily) the physical characteristics of the upper atmosphere in ways which are useful for both military and civilian applications. Still another said that ionospheric propagation research at medium, high and ultra high frequencies in "or" normal to broad-band ionospheric systems as well as to communication satellites.

A cross of the full 95-page survey is given. "Important Areas of Electronic Research" identified PB 171-521, can be obtained for \$7.25 from the Office of Technical Services, Commerce Department, Washington 25, D. C.



### Digital Computer Has Space Application

Miniature digital computers for space vehicles guidance and control is expected to be the more reliable and compact than a computer using semiconductor devices according to Sperry Gyroscopic Co. which developed the device. Computers (left) are perhaps more than 12,000 components per second. It weighs 19 lb., occupies less than one cubic foot and consumes 96 watts. Computer uses "dynamic logic" so that it consumes power only when making computations. Arithmetic unit (right) consists of two interrelated forms units. Magnetic unit used for storage of operating instructions can operate over frequency range of —67V to 200V, Sperry says.

ILLUSTRATION BY SPACE TECHNOLOGY, October 23, 1967

### TELEMETRY BY TELE-DYNAMICS

### Voltage Controlled Oscillator



Positive, reliable oscillator performance is essential to your telemetry data recovery needs. And Tele-Dynamics answers—the Type 1172A Voltage Controlled Oscillator is representative of Tele-Dynamics' creative effort in the complete telemetry field.

Characterized by excellent overall specifications, this new oscillator is high in electrical performance and environmental characteristics. Input 0 to 5 volts of  $\pm 25$  volts, linearity  $\pm 0.25\%$  linearity,  $\pm 1\%$  power requirement of 20 watts at 0 milliwatt maximum. Oscillator is 1% and amplitude modulation 10%.

Environmental characteristics include thermal stability of  $\pm 1.1\%$ , design bandwidth from  $-20^\circ\text{C}$  to  $+55^\circ\text{C}$ , unmodulated, 2000 modulation and 1000 modulation and more. The 1172A weighs less than two ounces and has a volume of two cubic inches.

For detailed technical bulletin, call the American Bosch Arms marketing office in Washington, D.C. or Los Angeles. Or write to call Tele-Dynamics Division, American Bosch Arms Corporation, 3000 Parkside Avenue, Philadelphia 31, Pa. Telephone TWenty 8-3000.

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**Radome & Antenna Test Systems.** Semi-automated and manual test systems custom engineered to measure various parameters - cross talk error, attenuation and gain values, axial symmetry, and others. (Dunn Bulletin D1000)

**Dynamometer Test Systems.** Evaluation of dynamic characteristics of gyro spin motors, microphone transducers as used in a closed-loop torque-sensing system. Typical systems include excitation and power supplies, servo, servomotors and controls. (Dunn Bulletin T1000)

**Inertial Test Systems.** Test and evaluation of dynamic and static performance of complete inertial guidance platform systems, subcarrier systems and background in inertial platforms offering HIG, gyro, FOG & PIGA units, stable platforms, and related items. (Dunn Bulletin TMA/TB2)

Dunn Engineering participation in Defense Department programs includes Talc, Falc, Sparrow, Hawk, Sparrow, M44, and others. Close customer liaison, both in proprietary products and custom specifications designed equipment, is a basic tenet of Dunn and results in lower costs and faster delivery for Dunn customers.

Dunn engineers are specialists in microwave testing, r.f. systems, digital systems and techniques, and inertial systems.

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DUNN Bulletin D-1700

Comprehensive literature will be forwarded upon request.

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## System Monitors Bioastronautic Data

By Russ Miller

Van Ness, Calif.—Control data gathering systems capable of simultaneously measuring the physiological reactions of a man in various aerospace environments and then storing or displaying data for inspection by observing personnel is being built here for the Fortranders Laboratory, Air Force Missile Development Center, at Holloman AFB.

Intended to handle up to 51 channels of both physiological and environmental information gathered from the subjects and ambient conditions in an current metal chamber for periods ranging to two weeks, the system is scheduled for shipment to Holloman next spring. Specialists, who are developing a study of S30-000 Air Force contract.

The system is referred to as VIDAT (Visual Data Acquisition System). It is expected to aid scientists at Holloman in their efforts to evaluate space vehicles to conduct research into the effects of abrupt acceleration and deceleration on animals and to measure and determine pathologically significant cosmic radiation.

VIDAT will display analog and digital data collected by sensors attached to the bodies of subjects and will be able to store a 45 computer input and later playback.

### System's Value

Principal value of the system, according to Specialists will not be its ability to:

- Display recorded data in form convenient to read and interpreted by each test subject.
- Provide real time storage of testing data (storage of up to two weeks, digital real time display of analog data).
- Obtain emergency digital samples in computer format for direct input to the host's Univac 1101A computer.
- Display telemeter tapes required from other tests as the system is compatible with standard GMV/M telemetry.

The VIDAT system as it is now connected to Specialists will contain three parts. These are:

- Physiological and environmental data sensors—input conditions and amplifiers all to be housed inside the environmental chamber at Holloman. Physiological sensors will be attached on the subject's body and the input conditions amplifiers mounted in room where will be supplied for zero line for comparison. Five conventional real-time displays will be used to monitor the chamber's ambient temperature, pressure, oxygen, oxygen partial pressure, carbon dioxide partial pressure and relative humidity.

- Data multiplexing and transmission system will be located in a rack outside the chamber. Input for multiplexing will be critical through an interface at moment from the test chamber. This computer logic to eventually tie into with the existing subsystems a video transmission system mounted on the subject's body, although this is not scheduled in the present Air Force contract.
- Data conversion, display and storage system involving both analog and digital data in control monitoring station situated about a quarter of a mile from the chamber.

Specialists, the more often subjects must be monitored with instruments in the subjects' bodies, the more accurate the data will be.

Physiological parameters which are to be measured include:

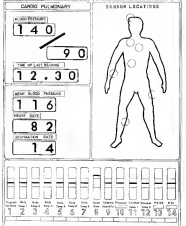
• Respiration—Close bond with status problem in gathering actual physiological data. This problem is compounded the computer data in the agreement that various sensors attached to and applied to sensors, satisfactory on the sensor's body, for periods up to two weeks.

### Recent Improvements

Concentrating on sensor design for two years, Specialists will incorporate recent improvements in sensor design into VIDAT. Typical of the nature of experts in use the new system is in electronic card-readers (ECR) circuitry consisting of a 2-in. wire mesh backed by a spring to hold it in close contact with the test.

Physiological parameters which are to be measured include:

- Respiration—Close bond with status



REPLAY OF PHYSIOLOGICAL and environmental data will include a cardio pulmonary and sensor location chart which provides digital indication of the physiological parameters and signals also reading external peripheral factors. Curves on body outline will contain numbers identifying specific location of body sensor.

# Westinghouse Electric Power Systems

# Serve the Advancing Needs of Flight

Electric power is the lifeblood of flight vehicles.

Instrumentation, control, guidance and navigation, communication, human comfort—indeed virtually every function in every modern transport, military or civil aircraft, missile or space vehicle depends on an electric power system.

For many years Westinghouse has specialized in the design and production of such systems. These have ranged from world-powered generators of World War I aircraft to today's superb brushless generators and static control equipment.

Headquarters for this important activity is the Westinghouse Aerospace Electrical Department at Lima, Ohio.



Here more than 1400 skilled men and women design, develop and produce airborne electrical equipment which has achieved an unexcelled record of trouble free service.



Here, too, skilled scientists and engineers are working on new systems to meet electrical requirements of flight in years to come. This work is directed by R. W. Sharpe, AED manager (left seated), A. L. Paquette, marketing manager (seated), J. B. Most, engineering manager, and P. W. Lowry (right standing), manager of advanced systems applications.



One of the most successful flight proved electric power systems ever built consists of 30 and 40 KVA brushless generators and static control apparatus for the Boeing commercial Jetliners. Mean time between removals is in thousands of hours—a dependability record many times better than that of ordinary brush-type generators.



Longer service life and greater reliability results from the elimination of commutators, carbon brushes, and collector rings. These are replaced by a single rectifier stack consisting of high-temperature silicon diodes. Westinghouse made this important advance possible. Results: greater reliability, increased TBO, reduced maintenance costs.



Westinghouse brushless generators are standard on Boeing 700s and 720s. The coming 3-engine Boeing 720, above, will have a new Westinghouse starter-generator system using the basic, time-proven brushless design.



The largest rated brushless air-cooled generators ever produced supply electric power for the Air Force B-58H, built by Boeing. These Westinghouse generators are rated at 120 KVA.



Oil-cooled brushless generators are provided for two major high-performance military aircraft, the Air Force B-58 "Hustler," built by Convair, and the Navy A-6A, built by North American Aviation.



Another military aircraft, the sleek Air Force T-38 Jet Trainer, built by Northrop, is equipped with Westinghouse 3 KVA brushless generators.



Space electric power systems also are a major activity at Westinghouse. The Air Force manned space glider, Dyna-Sove, to be built by Boeing, will have a new brushless generator and static control equipment to supply vital electric power.

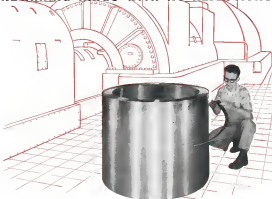
For the future, thermoelectric, thermionic, solar cells of high efficiency, magnetohydrodynamic and other advanced systems are being developed to provide electric power for space as well as non-space applications.

You can be sure . . . if it's

## Westinghouse



## RETAINING RINGS WITH NO REJECTIONS

CONSUMABLE ELECTRODE VACUUM MELTED  
NON-MAGNETIC STEELS ELIMINATE 20% REJECTIONS

Where high tensile and yield strength are required in non-magnetic steel many producers of critical parts are relying on Midvac Steels. In the production of retaining rings for generators, rejects which averaged 20% with our melted steels were eliminated with Midvac vacuum melted steels.

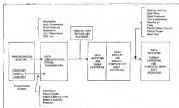
The Midvac Process eliminates contamination, metal soundness is improved, segregation is reduced, workability is increased and product quality is shipped up. Midvac Steels are offered in many alloys on billets or forgings to meet the most critical design specifications. Write for detailed metallurgical case history book to . . .

HEIDALE-NEFFENSTALL COMPANY • WICKTOWN, PENNSYLVANIA, PA.  
SUSIDIARY OF HEFFENSTALL COMPANY, PITTSBURGH, PA.  
Pittsburgh, Pa. • Indianapolis, Conn. • New Brighton, Pa.



# Midvac Steels

VACUUM AND CONSUMABLE ELECTRODE STEELS • RACK-UP ROLL SYSTEMS • FORGED STEEL ROLLS • FORGING RINGS • PRESSURE VESSELS • INDUSTRIAL ENGINES • DIE BLOCKS • MATERIALS HANDLING EQUIPMENT



**VARIETY DATA ACQUISITION** and display system being developed by Squelche, Inc., for Biomechanics Laboratory, Midwestern AFB, can acquire physiological data from either human or animal subjects during tests of up to two weeks in environmental chamber. Physiological and environmental data can be acquired, coded and sent to display and recording center. Data is then displayed in analog and digital form, tape recorded in analog form and digitized and recorded in computer tape tapes.

gogo will be employed to provide complete responsive waveform.

•Skin and deep body temperature—Transducers will be recorded by thermistor sensors.

•Electrocardiogram—ECG will be displayed on scope or strip chart.

•Blood pressure—Conventional medical cuffing and technique, with the cuff around the subject's leg at the likely place for these measurements.

•Heart rate—This will be determined by taking ECG to a heart rate computer (analog) which counts characteristic spikes in the ECG to adjust heart rate. Respiratory rate similarly will be obtained from the respiration surface.

Under a separate contract from Edwards AFB, Squelche is developing an animal technique of obtaining blood pressure—a technique which it expects to propose as an additional monitoring method for the VIDAAT system.

The technique, called pulse wave velocity measurement, promises to do away with the need for occluding a limb and now provides a continuous in vivo measurement of the supplied readings obtained by the occluding cuff method, decrease measurement of blood pressure. It also might indicate changes sooner than would the conventional occluding technique.

**Technique Explained**

This technique involves measurement of the velocity of a sound wave generated as the heart valves close. The wave travels down the artery at a velocity which is nearly linear with blood pressure over the central portion of the blood pressure range. By measuring this time period with the aid of a

chronometric scale in the ECG as a reference, velocity of the wave can be determined, and from it blood pressure.

Once necessary data is obtained from physiological and environmental sensors within the chamber, the data is transmitted, coded and sent over the line, put to a video, timing and rate patch panel.

Data signals are multiplexed into standard telemetry form as the receiving portion of the system can use standard techniques of handling telemetry data and also be able to accommodate other telemetry types.

The selected frequencies of voltage controlled oscillators in the frequency

use are kept low (below 14.5 kc) which enables data to be recorded slowly as required from an Arden 608 tape recorder.

Coded data recorded at the video patch panel is fed into a data acquisition unit, which supplies wide bandwidth analog voltage outputs. Some of these signals are passed into special counters whose heart rate is determined from ECG and a heart reference, systolic and diastolic blood pressure from cuff pressure and Korotkoff sound etc.

These signals as well as original analog data feeds are first multiplexed, then broadcast, and last and body temperature are transmitted to a display and in which analog-to-digital converters transform data into digital form.

These inputs are sampled at low rates (less per 15 sec., one minute or two minutes). Word blocks are made for 727 computer tapes which serve as input for 1181 computer.

In the display, binary data is converted to decimal form and displayed in the console as well, tape format, tape

TELEMETRY BY  
TELE-DYNAMICSNEW Low Level  
Subcarrier Oscillator

The Type 12MA Low Level Subcarrier Oscillator is an outstanding member of Tele-Dynamics' new line of transformed telemetry components for today's aerospace applications.

Designed to operate at estimated altitudes, the 12MA can be activated by a 5 millivolt level differential signal. The input impedance is greater than 50 K ohms. It is extremely stable, has true differential floating input, and inherent diodes leading which permits over-voltage of greater than 1.25V.

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## This Baby is Bayonet-Locking

Meet DTK...the best little bayonet locking electrical connector available today. DTK is short for Deutsch Tri-Kam and refers to the triple cam coupling design that assures fast, positive engagement and lock. As a direct descendant of MIL-C-26483, this baby is interchangeable with existing MS 3110 and 3116 series connectors. The DTK also inherits many desirable features from its Deutsch ancestors including superior silicone inserts and MIL-C-26636 crimp-type contacts that are insertable and removable with military standard tools. Color-keyed mating indexes and 7-point inspection for lock, make this latest generation connector a cinch to couple, even in remote locations. For more vital statistics on the latest addition to the Deutsch family, contact your local Deutschman today or write for Data File #10.



**DEUTSCH**  
Electronic Components Division • Municipal Airport • Torrance, California

ADVANCED SPECIFICATION MINIATURE ELECTRICAL CONNECTORS

## DEUTSCH CONNECTORS

24 Hour Delivery  
CONCEPT-TO-COMMIT

- DC Series—push on/lock MIL-C-26483
- MS Series—crimp pull, insertable, removable crimp contacts
- DTK Series—bayonet lock, insert or extract applicable requirements of MS 3110/MS 3116
- LMS Series—high speed lock and crimp, industrial applications performance
- DC Series—push on/lock crimp contacts, crimp type 100 connector
- DM and DM Plus Series—plug in metal seals, lock pinned plug in metal seals

**ARCO**  
electronics inc.

DEUTSCH CONNECTION DIVISION  
CONCEPTS WHEN YOU NEED IT — FROM 1 HOUR  
TWO WEEKS TO 6 MONTHS

DALLAS  
ARCO ELECTRONICS, INC.  
1200 Commerce  
Suite 100, Room  
Brennan, Dallas  
TX 75201

NEW YORK  
ARCO ELECTRONICS, INC.  
1200 So. Broadway  
New York, NY 10019  
Customer 1 (212)  
FAX 212 701 2121

members, corresponding to the quantitative values of physiological and environmental factors physicians are accustomed to seeing.

A single pulmonary doppler probe is included in the device's circuit. It provides the test monitor with necessary information to assure loss of the safety of the test subject. Information is presented in digital form and includes arterial and diastolic blood pressure, heart rate, respiration rate, temperature and possibly mean blood pressure. A pictorial outline of a human body with sensor locations indicated tells the monitor in pinpointing spots of concern.

Some data from analog data path can be displayed on an oscilloscope as a scope.

One problem encountered by the company is that work as in providing skin and body temperatures to the high accuracy (within 1%) required by the Air Force. Because even a slight error in measurement of human temperature could cause inaccurate alarm, special temperature is not from the sensor probe signals to directly drive the digital display.

## FILTER CENTER

■ Fuel Cells for Apollo Electrical Power—Fuel cells probably will be supplied in the primary source of electrical power for the current Apollo lunar spacecraft because of expected ability of these electrochemical sources to supply kilowatt level power for periods of several weeks. National Aeronautics and Space Administration has specified that battery type fuel cells should be employed in Apollo spacecraft proposed design but it gave prospective prime contractor option of quoting an alternative, comparable power source.

■ Flight Test for Fuel Cells—Two 10-lb. air exchange membrane fuel cell batteries will be flight tested in a Blac Scout vehicle test aircraft as an effort to determine feasibility of removing condensate from the batteries over a long period of time without flooding in one gravity condition. Test being conducted by USAF's Aeronautical Systems Division, soon at putting a one-plate fuel cell capsule (two batteries plus instrumentation) as a 10 day, 100-mi. orbit. Batteries to be used by General Electric's Aircraft Division. The test Department is still concerned from the ground he burning them on and off.

■ Electrical Power From Bethe-Bethe—Batteries supplying substantial levels of power by converting life energy of bacteria into electrical power are being developed by Magna Power, Inc.,

Anchorage, Calif. In one concept bacteria with an appetite for specific materials are placed together with them in a container of sea water. As the bacteria eat the materials the latter's electrical state changes. The change of state, occurring during metabolic processes, is then the source of current since it creates an electron movement in another type of battery, somewhat akin to the photovoltaic process used in conventional solar cells. Bacteria of certain type utilize energy in response to certain wavelengths in the solar spectrum.

■ New Millimeter Tubes Coming—New bakker power tubes operating in the millimeter wavelength region are being developed under Rome Air Development Center sponsorship. These include a backward wave oscillator with a continuous wave output of 70 watts at 5 mm and a 200 W traveling wave, a similar tube with an output of 2 watts at 4 mm and a 50 W traveling wave, and a Compton oscillator at 2 mm, which is expected to have an output of about 1 watt.

■ New Laser Materials Available—Two companies have announced new materials for use in optical lenses. They are Valpar Central Corp., Holliston, Mass. reports a material with superior optical properties, providing increased optical action for greater efficiency and improved coating.

■ Solid-State, Inc., Sonoma, Calif., has developed an in production an battery formed along with resistor which has an output wavelength of 26,000 angstroms, in the infrared region.

■ Energy Conversion Abstracts Available—Report containing 548 abstracts of articles on direct energy conversion, including thermionic, photoelectric, magnetohydrodynamic, electrochemical and energy storage, prepared by Naval Research Laboratory, is available from Office of Technical Services Contract Dept., Washington 25, D. C. Report, entitled "Direct Energy Conversion Literature Abstracts" identified as AD 255-594, is priced at \$2.75.

■ Supersonic Transport Problems—Glimpsing an accurate heading reference to supersonic transports designed to fly at Mach 3 may be a problem because of shrouded steel construction required at such speeds which will prevent use of magnetic compass for heading and drag at supersonic speeds. However, progress during past decade in shrouding effect of cables of great gauges that give with relatively low draft rate has available by the time the need arises.







# KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with how best to finish alloy steels. Through much of the information to be presented, by means of both the text and the illustrations, you will be able to determine the most effective way to finish alloy steels in the field, thereby saving time and money.

## Cold-Finishing of Alloy Steels: The Effect of Cold-Drawing

The cold-drawing of alloy steels was discussed in general in the advertisement prior to this one. Here, we explain the effect of cold-drawing.

During the cold-drawing process, certain changes take place both in the steel structure and in mechanical properties. There is a slight increase in tensile strength, compared with a substantial increase in yield point, and a decrease in ductility. These properties make possible the production of small parts which require the greater strength necessary for certain automatic-machine finishing operations, and a machine finish superior to hot-rolled material. Naturally, the beneficial effects of alloy steels are attained in the subsequent heat-treatment of parts.

Cold-drawing results in bars free from scale, accurate to shape, and within close tolerances. These bars are ideal for automatic machining, since the elimination of scale is conducive to long tool life, and the accuracy of shape and close tolerances permit the bars to pass freely through the feed mechanism of the "automatic." Moreover, the cold-drawn finish and tolerances may be such that machining can be eliminated in some cases of the finished part. For example, nuts and bolts, produced from hexagon alloy bars, require no machining on the hexagon sections.

Continuous roller heating and controlled furnaces of both standard and com-

pressed-atmosphere types are used for normal treatment of alloy bars before cold-drawing. Thermal stress-relieving can be used to reduce residual stresses in the steel caused by the cold-drawing process, which alters the mechanical properties, depending upon the temperature used.

If you would like more specific details about the chemical composition or mechanical properties of cold-drawn alloy bars, and the results that you can expect, let all names consult our technical staff. Bethlehem metallurgists will gladly help you work out any problem, without cost or obligation on your part.

In the next advertisement in this series, we will discuss the turning and grinding of alloy steel bars.

Remember that Bethlehem produces a complete range of cold-drawn alloy steel bars in rounds, hexagons, squares, or flats, in standard, cold, drawn or metric sizes, as well as special sections. We also make the full range of hot-rolled AISI standard alloy steel special-analysis steels, tool steels, and all hot-rolled carbon grades.

This series of alloy steel advertisements is now available in a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Bethlehem Department, Bethlehem Steel Company, Bethlehem, Pa.



See Strength  
See Economy  
See Versatility

# MISSILE ENGINEERING

## TRACE Monitors Titan I Base Progress

Dallas, Tex.—Fast response data collection and reporting systems weekly routine to detail the construction of Minuteman I missile launchers. The information to provide a true picture of the value of the work accomplished. Each second an International Data Systems 780 computer and data processing system, TRACE (Trans Reporting and Control System) is activated, under contract by Ling-Tecno-Vought, Inc., from the U.S. Army Corps of Engineers, Ballistic Missile Construction Office, Los Angeles.

For BMCO, the reporting system covers 10,000 work items as listed in the agency's "task and metric" responsibility of getting the base ready for USAF acceptance, including excavation, pouring of foundations, structural steel work, all masonry, air conditioning, roof repairs, ventilation, power houses and lines and preflight loading system.

Contract with LTV initially covered with 9,000 items, but afterwards of the system which BMCO considers its most valuable report of progress and the best source of information on the construction project—has led to its extension to develop data in even finer detail

TRACE is an adaptation of a data system used by Texas for some years covering 80,000 items subcontracted—keeping track of every step of the process from the time the raw stock or machine shop equipment is constructed to the time that particular piece of work is completed. The company states that the system has been responsible for its never missing an additional dollar due in the night when the system has been in operation.

As related to Titan I base construction, TRACE provides weekly reports with comparison of the completion percentage of each division of work to be accomplished, the status of critical equipment, listing of scheduled materials of work, which were not accomplished as scheduled and delivery of material due during the next reporting period.

Monitoring progress for the computer is developed by LTV in manufacturing plant, using Corps-supplied work drawings, specifications and schedules for each launch site. Then the data are broken down into five detail from computer to system, subsystem and all three attached equipment and work elements are assigned to each step of the construction. This detail is carried

down to, for example, the installation of materials for a generator that supplies power to an air conditioner (considered a subelement) that is part of a generator preflight loading terminal (considered a critical) in a particular launch site. Highlight of the work element system is that these elements are weighted differently depending upon their importance in the construction, making a point system that bears a relationship to base and cost-determined by construction industry standard flat cost data.

Weighting factor is a crucial part of the program, that it provides the guide to the actual value of work accomplished and that yet to be done. Since values of work accomplished cannot cover up for slippage of some critical items that actually would put a site behind schedule, which can be the case in some other reporting methods that had been used. LTV/TRACE arguments pointed out, for example, that one base had been considered 91% complete, whereas their system showed that the installation was only 70% along the way to completion.

The number used for computer analysis contains 10,000 code, each one representing a work element, its scheduled date to start date, scheduled com-



Saturn Booster Alignment, Weighing

Before first stage booster is checked in, Base Engineering Co's WMANAC system (shown in model form at ARS meeting) which determines booster weight, center of gravity location and moments of inertia about all three axes. System also optically reads preflight tracks, engine thrust vector and various measuring paths with respect to both the environment and geometric centerlines of the booster. WMANAC system will be used to completely measure checkout equipment. Complete determination of Saturn first stage characteristics took 14 days using WMANAC (Weight, Alignment and Mass Control Determination equipment).

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. External Sales/Technical Steel Experts Committee

**BETHLEHEM STEEL**





# Edo EDO LORAN C NOW

EDO, world leader in the design and manufacture of long range navigation systems\*, proudly announces the immediate availability of the new Edo Model 345 A/C Loran ... complete Loran A and the vastly extended, far faster Loran C coverage in a single system.

## Advantages include:

- ✈ **Light weight**
- ✈ **Low cost**—complete A/C unit is less than half the price of Loran C systems available or in the making today.
- ✈ **Direct reading console**—panel-mounted unit is simple to operate, permits Loran C fixes 3 times faster than with Loran A.
- ✈ **Outstanding performance**—accuracy of pinpoint fixes is limited only by the sharpness of the pencil. Maintenance-free, too.

**AND AVAILABLE IMMEDIATELY!**

\*Many other manufactured aids in the world are now being phased out. Only Edo's 345L Series ... is also on the NATO and the military standard of many NATO nations. Edo Model 345L, quickly and accurately installed in Edo's 345 A/C, will give you the very best Loran C plus Loran A coverage.

Write today for new Edo Model 345 A/C brochures, Dept. A-6.

**EDO CORPORATION** • College Point 65, L.I., New York

A-6 only. SEE JOURNAL/ LITHING • BOSTON, MASS.

## USAF Contracts

Following is a list of unclassified contracts for \$25,000 and over as awarded by U.S. Air Force contracting offices.

**RESEARCH AND DEVELOPMENT CONTRACTS, AIR FORCE SYSTEMS COMMAND, RAND LAFAYETTE BARRACKS, FORT MONROE, VIRGINIA**  
**AFPR004-69-001** (AFPR004-69-001) awarded May 11, 1969, \$25,000.

**University of Alaska College Alaska, the state of Alaska Department of Education, 1000 University Avenue, Fairbanks, Alaska 99701**  
**AFPR004-69-001** awarded May 11, 1969, \$25,000.

**General Dynamics Corporation, International Systems Division, 10000 International Drive, Fort Worth, Texas 76101**  
**AFPR004-69-001** awarded May 11, 1969, \$25,000.

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**AFPR004-69-001** awarded May 11, 1969, \$25,000.

## When snows come like this...



## will you be prepared like this?



Remember that Winter when prolonged snow means disrupted flight schedules and caused numerous costly delays!

To effectively combat sustained snowfalls, existing Models T-325SL and T-500SL, snowcats towing cables can become high speed (up to 20 mph) snow fighters in 15 minutes time by adding a special snow door attachment.

This blade is 50" high, has vertical hydraulic control and can clear a 20' wide path over snow and ramp areas in one sweep. It is specially designed to ensure its snow load through a unique ramming action that keeps tire spillage to a minimum and eliminates the need for additional power. A special stopping mechanism permits the bottom of each side plate to follow ground contour. This allows working over uneven surfaces without reducing travel speed.

With only a minimum investment for this dense blade, you can convert your T-325SL/T-500SL into a dual purpose machine that will provide one of the basic tools you need for Winter maintenance. Call or write for complete information.

**HOUGH**

THE PRIME II HOUSE CO.  
 875 Broadway Ave.  
 (Overhead) 1000  
 10000 International Drive, Fort Worth, Texas 76101

From contract to close:

☐ APPROVED FOR THE AIR FORCE  
☐ APPROVED FOR THE AIR FORCE  
☐ APPROVED FOR THE AIR FORCE

DATE: \_\_\_\_\_



**New! For high quality... high reliability...**  
**FAFNIR Teflon\*-lined Bearings**



NTM = number of ticks; source = wild dog

g p a r e n t i f i c a t i o n . — i n t e r n e t s p a n d i n g

To meet increasingly critical reliability requirements in high-performance aircraft, Fafnir announces development of a new line of Teflon-lined bearings.

These new bearings — made to highest quality standards — incorporate unique Fafnir features.

A circumferential groove in the face of the outer ring of SBE Series Spherical Bearings, for example, permits self-alignment of the bearing to the housing, rather than forcing the housing to bearing. Expansive housings remain unwarped, undamaged. Bearing thrust capacity and resistance to vibration are increased.

Fuller Teflon-lined Bearings are available in spherical, rod end, and journal types. They are self-lubricating and provide low-torque performance under severe loadings. The Teflon liners are shock-resistant and chemically inert.

Look to Fafnir when design calls for Teflon-lined bearings — and where service calls for maximum reliability. Write for the new Fafnir Teflon-lined Bearing Bulletin. The Fafnir Bearing Company, New Britain, Connecticut.

20. Just a few days after the 9/11 terrorist attacks, the world's



**FAFNIR**  
BALL BEARINGS

## AERONAUTICAL ENGINEERING

### British Weigh VTOL Powerplant Designs

Re Herbert L. Coleman

**London**—Division in the British emphasis on VTOL design—propellers with notable nozzles, or pure lift engines combined with a propulsor to give—rose into sharp focus at the recent Eighth Anglo-American Aeronautical Conference here.

The protagonists are Wlad Sadowski, owner of the BB-37 Pegma, the single powerplant with axials nesting 10 deg., and Rolf Rauer, designer of the RB 105 and RB 162 pure jet engines, setting in combination with propeller engine, or combinable in three ways.

Both designs have flight time. Rollie Fowler has considerable experience with the RD 308 engine in the Short SC 1 and Bristol Siddeley is getting its motor flight experience in the Hawker Siddeley P 1127 strike fighter (AWC contract Sest. 4).

But despite its confidence in the acoustic type of thrust deflection, Texas Instruments is hedging its bets by developing a quiet jet engine, possibly for the Naval Air Force tactical transport replacement competition (AW Sept. 18, p. 41). It would be used to give 100% VTOL capability to an airplane fitted with four F404 engines.

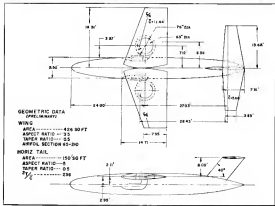
In support of the deflected thrust system, Dr. S. G. Moniz, head of the Bristol Siddeley design team which came up with the Pegasus and he could use as proof as "going somewhere a free ride around the countryside," is referring to pure left engines out of left (tail) and propeller engines taking over.

On the other hand, B. Pessen, chief engineer (performance and research) for Rolls-Royce contended that if designers are aware of VTOL characteristics, they may as well make the airplane completely VTOL. Referring to these

deflection occurs, Pearson claimed that deflection weight was such that designers should consider adding more light weight lifting power. Kalls investigated. Pearson added, there little penalty in pan lift, as against deflating the thrust, noting that deflection also decreases the capric position, i.e., moment of all adds a lateral moment.

One U. S. delegate, Norrman E. Nelson, Dask Aircraft Co.'s chief engineer on the Dask VS-4DA, backed the tilt-fan design as proven after 750 hr. of flight testing for the U. S. Army. Nelson said the VS-4DA could make a 6 sec. transition (11 sec. normally) and had flown at 200 mph. at 25,000 ft. Nelson added that the VS-4DA "has even flown backward."

Disarming helicopter, George S. Schiavi, vice president, research and development of the Becton Co. and the machine "appears to have no obvious connections to these medications."



**VIEW OF FULL SCALE** (twins wing test model) for use in National Aeronautics and Space Administration's Area, wind tunnel







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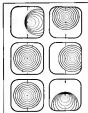
Here's what Lord Dyna-damp Circuit Boards can mean for your sensitive applications: control of resonant response... amplitudes and G levels reduced to only 1/2 the response of standard boards... protection of sensitive components against vibration, shock, and... lighter loading of boards in high-density packages... freedom to use lighter, smaller, less rugged components.

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Get detailed information on this latest advance in vibration/shock/noise control from your nearest Field Engineering Office listed here or the Products Dept., Erie, Pennsylvania.



**CATHODE RAY** penetration for V101 lead bonding path directly at apex of a cone. Stripes will be laid on flat SC-1

tion, in which the anode is connected to ground down a cone, the apex of which is positioned beyond the leading point. Floods and has reached outer periphery a representative of displacement from the correct track, plus a degree of defocus is described as "misalignment."

Vertical tilt and lead position will compound electronic accuracy in that of ground errors due to thrust bias, according to John P. Campbell, head of the NASA dynamic stability branch, Langley Research Center.

### Exotic Realities

Introducing result of the NASA tests using the Canis-Wright X-100 100-megapixel VTOL aircraft was that when a surface is not, resistance to erosion is greatly greatly increased. Sand, or loose dirt, mixed with water could not reach surface dynamic pressure of up to 20-15 psi. On tests on a sand bath, Campbell and numerous divers were also obtained with the X-100, about 15 psi, was not great enough to disturb net sand.

Tests with dry ground of varied size showed that dynamic pressure needed to start erosion increases as the size of the particle increases, that erosion with this type of surface can be predicted at least approximately. A good net surface also could withstand dynamic pressure up to 2,000 psi, although further tests show that net erosion depends to a great extent on type of soil and resistance.

Campbell said that for optimal take-off and landing operations from a given spot, VTOL aircraft will require some form of site preparation, such as concrete plates or special types of concrete. Asphalt is not satisfactory because it not only is subject to blast erosion, but melts and shatters under the stress

may be thrown against the aircraft. Remediation of debris in shorter-term problems, even for helicopters with their low deployment velocities. In long-term operations, such as those of the V-22 Osprey, which is a tilt-rotor aircraft, the debris will be thrown against the aircraft.

Tandem to blow debris up toward the aircraft is suggested when there are two or more helicopters speed down the lower part instead of a single helicopter as in most helicopters. With two or more, there is a strong upward flow against the bottom of the aircraft with greater danger that the machine will be damaged by debris.

Campbell suggested some form of deflector, either on the aircraft itself or on the landing area, to prevent damage to the landing or propulsion system. Or, he added, the deflector could be directed slightly away and to cause VTOL runs whenever possible, blowing dust and debris backward away from the aircraft.

### PRODUCTION BRIEFING

**Royal Canadian Air Force** has ordered four additional Boeing Vertol 107 helicopters, bringing to six the number of aircraft purchased. The helicopter, designated CH-119, will be used for rescue and general utility work.

Army has authorized a transmission overhaul rate of 1,000 for the Boeing Vertol H-13C. Problems, overhauls were acquired over 714 in.

**Hughes Aircraft Co.** has received a \$5.25 million contract from the National Aeronautics and Space Administration to develop a solution for use with open cold liquid propellants. A solution, dinitrogen tetroxide, will be effective in both launch and deep space environments in flight.

**Teknocomp Corp.'s Power Source Division** will develop and manufacture an automatically regulated power battery for the future in light electrical power for the Polaris A3 guidance system and a control of controlled systems from Lockheed Missiles and Space Co.

**Solar Aircraft Co.** will develop and test testbed systems for aerospace vehicles under a 21-month contract from USAF Systems Command's Aerospace Test Systems Division. The project includes and Space Co. will conduct inspection and structural analysis. Contract calls for development of a testbed to 1,000 to 5,000 up to 10 mm, with total weight less than 100 lbs, and a capacity velocity of 51,000 ft/min.



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**BAMBI CONCEPT** of defense against ICBMs would use satellites used with interceptors which would be fired at before missile booster during launch phase. Analysis of satellite-based defense system by North American Aerospace Defense shows (background) envelope (right) within which boosters can be intercepted by missiles fired from the satellite.

## Bambi ICBM Defense Concept Analyzed

By Philip J. Kiss

New York—Satellite-based ICBM defense system, similar to Project Bambi (baltic missile booster interception) would require between 800 and 1,600 satellites in low altitude orbit to provide full global coverage, according to an analysis generated here during the recent American Rocket Society Space Flight Report to the Nation.

The feasibility of a satellite-based ICBM defense system recently is under study by Convair, Hughes Aircraft and

Space Technology Laboratories under sponsorship of Defense Department's Advanced Research Projects Agency as part of the Project Defender program (AW Jan. 15, p. 17).

The report, entitled "Space Operations on a Satellite-based ICBM Intercept" was written by Rudy R. Mueller of North American's Aerospace Division, whose company was an earlier bidder in the Bambi program.

The weight of satellites and interceptors which must be put into orbit for a Bambi type system can be checked by

a factor of 100-1 though the use of computers about the satellite launcher to discriminate between ICBM launch targets which can be successfully intercepted and those which cannot and through the use of interceptors missiles powered by extremely high speed nuclear engines, Mueller's analysis indicates.

The Bambi ICBM defense system concept calls to intercept the ballistic missile during its boost phase, when the booster itself is easily detected by its intense infrared radiation and when it is in a "pre-boost" "burning" state. An additional advantage to interception during boost is that there is little opportunity for complex decoys at during boost phase (AW Jan. 1, p. 11).

Launched in the Bambi anti-ICBM concept is the requirement that the satellite launch platform must be within several hundred miles of each ballistic missile launch site. This means the important question of whether the Soviet Union or the U. S. would lose tolerance the presence of armed anti-ICBM satellites over its territory, even if the interceptors missiles carried non-nuclear warheads.

The U. S. already is developing techniques for intercepting and reporting airborne satellites, and the USSR may be proved to be doing likewise. The large number probably several thousand, of anti-ICBM satellites required to provide necessary coverage, coupled with natural attrition due to the required low altitude orbits and loss due to enemy interception, has raised questions about the economic feasibility of the Bambi approach (AW Jan. 25, p. 29).

However, in Mueller's analysis he lays the study to the physical parameters of the Bambi type anti-ICBM prob-

lem without attempting to assess the overall feasibility of the basic concept. The requirement that the anti-ICBM satellites detect the target and launch its infrared-guided interceptor missiles is one way to intercept the target before the end of its boost period "in a sense in which it would require high accelerations and velocities for the interceptors," Mueller said.

For the Automatic analysis Mueller assumes a self-propelled missile always is an appropriate target because its total boost period lasts for only three minutes. Allowing up to one minute after launch for detection by the anti-ICBM satellites, provides a maximum time of flight to interception of 130 sec. for the interceptor missile. This corresponds to an intercepter missile range of up to 500 mi., depending upon the type used.

### Importance of Prediction

The value of using computers about the anti-ICBM satellite to not only intercept targets from those whose flight path will take them out of range of one satellite's intercept circle is illustrated in the accompanying sketch (p. 12) showing coverage domains (three concentric circles).

The outer circle contains the earth-based launch points of all ballistic missiles, which presumably would cause within range of the satellite's intercepter missiles. This middle circle defines the maximum range of the satellite's interceptors. Thus any ballistic missile whose launch pad is within the outer circle and whose trajectory takes it into the area enclosed by the middle circle is a target which can be intercepted. Any ICBM whose launch pad is within the outer circle but whose trajectory is such that it does not cross into the area

enclosed by the middle circle cannot be intercepted by the anti-ICBM satellite, although it would be a suitable target for an advancing anti-ICBM satellite.

Similarly, any ICBM whose launch pad is within the middle circle is a potential target only if it traverses an area such that it crosses within this area for approximately one minute. If it moves outside the area of the middle circle, it cannot be intercepted by the satellite shown, although it will then become a target for an advancing satellite.

Only three ballistic missiles whose launch was within the maximum coverage circle of one missile within its intercept radius of the satellite's intercepter regardless of trajectory cannot cross this outside of the area enclosed by the middle circle before the intercepter arrives.

This means that any anti-ICBM satellite which does not employ a computer to track its targets and predict their future position cannot meet its own objective of covering those targets.

As the outer circle and the inner, more intercepter missiles range of which can meet targets to intercept their targets is near. If the intercept is delayed, the outer circle expands and each satellite's area of responsibility is lowered to the maximum circle, considerably more satellites will be required to blanket a given area.

### Example Cited

For example, in figures cited by Mueller for several possible operational systems, to achieve global coverage with one predictor system requires 3,618 satellites compared with only 2,290 where prediction is used, assuming interceptors are continuous bearing rocket engines.

For high initial impulse interceptors, 375 would be required for global coverage without predictor compared with 510 with predictors.

However, this requires considerably more complex equipment, about 10 times the weight, which increases the likelihood of failure which in turn might require the use of more satellites for redundancy.

(Mueller does not attempt to factor redundancy and individual satellite reliability into his analysis.)

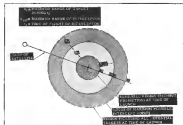
### Target Discrimination

In determining optimum system characteristics, the Automatic analysis assumes that small numbers of ICBMs will be grouped together in "clumps," where the spacing between individual launch pads in a few miles, while the distance between clumps of missiles will be large compared with the radius of action of a single anti-ICBM satellite, such as ranging from perhaps 100 to 1,000 mi.

Thus in the type of launch pad location arrangement being used by the U. S. in order to minimize the number of missiles that might be knocked out in a saturation attack, while minimizing the problems of missile control and maintenance.

"Consideration of the economics of the ICBM versus AIRCM 'game' (one theory) will show that from the opponent's viewpoint this type of distribution strategy is precisely what he would use in order to maximize the cost of the AIRCM system for a given number of available target vehicles," Mueller says.

In the Automatic analysis, Mueller assumed that each satellite has a bearing area of responsibility (sketch, p. 17) providing small areas of overlap



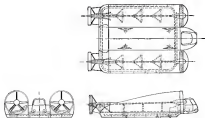
**SATellite coverage** domains are shown in diagram above of using computer about satellite to predict which ICBMs will cross within range of its orbit. All ICBMs which may be intercepted from a satellite will come from launch pads that lie within largest circle, but only those whose trajectory brings them within the area enclosed by the middle circle can be intercepted. Unless satellite has computer to predict each ICBM trajectory, the only ICBM which are certain to be within intercepter range are those whose launch pads lie within smallest circle.

| CONCEPT                 | DATA    | Relative Range | Maximum Altitude Range | Characteristics Velocity | Average Acceleration | Intercepter Weight | Shooter of Coverage | Number of Satellites | Overall Weight of System |
|-------------------------|---------|----------------|------------------------|--------------------------|----------------------|--------------------|---------------------|----------------------|--------------------------|
|                         |         | $r_{rel}$ (mi) | $r_{max}$ (mi)         | $v_{rel}$ (mi/sec)       | $a$ (g)              | $w_{int}$ (lb)     | $c_{cov}$ (mi)      | $N$                  | $w_{sys}$ (lb)           |
| Accelerative Prediction |         |                |                        |                          |                      |                    |                     |                      |                          |
| Constant                | None    | 483            | 593                    | 50,000                   | 13.1                 | 254                | 244                 | 3432                 | 1,292,800                |
| Constant                | Perfect | 270            | 768                    | 30,480                   | 1.44                 | 12.1               | 437                 | 2260                 | 83,600                   |
| Impulsive               | None    | 460            | 1899                   | 15,800                   | N/A                  | 48.3               | 434                 | 970                  | 54,000                   |
| Impulsive               | Perfect | 395            | 873                    | 22,380                   | N/A                  | 12.1               | 714                 | 810                  | 12,100                   |

### Conditions

1. Changed trajectory, widely spaced
2. Maximum relative altitude range,  $r = 145$  mi
3. Out-of-range altitude range,  $r = 6.30$  mi
4. Proportion average specific impulse,  $I_{sp} = 310$  lb/sec/lb
5. Satellite weight factor,  $k = 0.25$
6. Interceptor efficiency factor of intercepter,  $\eta = 0.15$
7. Interceptor time of flight,  $t = 120$  sec
8. Target horizontal travel during  $t$ ,  $s_t = 250$  mi/sec
9. Interceptor range during flight,  $R = 5,40$

**TABLE COMPARES SEVERAL OPTIMIZED** Bambi-type ICBM system configurations, showing number of satellites needed for each system and various other loss of comparison. Note variation in the weight of the different systems.



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The smaller of the two Aeronutronic designed vehicles will weigh 8,000 pounds, carry a 2½ ton payload, cruise at 30 mph. It will have a range of 100 miles and a grade capability of 30%.

The big machine is a high speed, heavy duty carrier. Weight: a hefty 44,500 pounds, payload: 22,000 pounds, speed: a fast 80 mph, range: 300 miles. It, too, will have a grade capability of 30%.

In spite of this evidence of accomplishment, Aeronutronic's work in the field has just begun. Army Transportation Corps and Navy contracts are speeding further studies into the potentialities of the new vehicle. The ACV is destined to play a significant role in future military and civilian transportation.

Further information regarding the air cushion vehicle, as well as other exciting projects in work at Newport Beach, may be had by writing to Aeronutronic.

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between adjacent satellites.

To illustrate the use of non-directional parameters developed in the Automatic analysis and to give an indication of typical numbers, Mueller applied the parameters to four different situations:

- No prediction and constant acceleration of interceptor missiles.
- Perfect prediction and constant acceleration of interceptor missiles.
- No prediction and high-impulse initial launch of interceptor missiles.
- Perfect prediction and high-impulse initial launch of interceptor missiles.

### Prediction Results

The results shown in the accompanying table indicate that a satellite that does not require prediction and uses constant acceleration interceptors would provide an area of coverage having a diameter of 344 naut. mi., thereby requiring a total of 3,620 for global coverage. With the addition of perfect prediction, the diameter of the area of coverage of a single satellite would increase to 627 naut. mi., cutting the total number required to 2,290.

Using high initial impulse propulsion for the interceptors would increase the diameter of the satellite's area of coverage to 675 naut. mi., and reduce the total number required for global coverage to 978. With both perfect prediction and high-impulse propulsion, the diameter of the coverage area would increase to 718 naut. mi. and the total number required thus would be cut to 816.

A gross measure of the total weight of hardware that would have to be put in orbit for these four different system approaches can be obtained from the calculated area of total weight of satellites and their interceptors (in the weight of the interceptors) (rounded) alone.

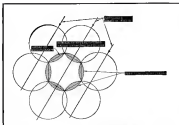
For the worst case, using constant thrust propulsion and no prediction, the figure is 560 times larger than the gross weight of the satellite and its interceptors with prediction and high initial impulse, Mueller's numbers indicate.

Depending upon the design approach selected, the optimum effective intercepting satellite range varies from 270 to 600 naut. mi.

### Some Factors Excluded

Mueller cautions that his analysis does not include some factors, such as the minimum detection range of satellites and interceptors and the interceptors' required bearing device.

Despite these limitations, Mueller concludes that there appears to be an "enormous" advantage, in terms of total system weight in orbit, to the use of target prediction about the satellite and negative acceleration of an interceptor missile.



SPACING between adjacent satellites will depend upon their effective range of action. Some overlap in coverage would exist as shown in sketch above.



### Re-entry Drag Balloon Developed

"Ballute," coated fabric drag balloon, capable of inflicting as much as 100 percent deceleration of manned and unmanned re-entry vehicles, has been developed by Goddard Space Flight Center. Once the 9-ft.-dia. ballute has helped ease the re-entry vehicle through the hot, better understood on entry, the upper atmosphere, a parachute would be deployed to complete the recovery. The high-drawal recovery system was developed for the Air Force Systems Command's Advanced Systems Division.

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## Government-Industry Relationship Re-evaluation Asked by Douglas

Outbreak of the current government legislation of 1947 and the jangle of extensions and interpretations that has sprung up around it has been suggested by Donald W. Douglas, Jr., president of Douglas Aircraft Co. in a speech at the Western Briefing Conference on Government Contracts at Monterey, Calif.

Douglas also suggested a fundamental re-evaluation of the philosophy under which the government does business with defense industries. He said that the government industry relationship set up in 1947 has been made obsolete by advances in science, technology and non-traditional philosophies.

Douglas called for the abolition of the system, representative for advertising bids. The complexity of modern aviation equipment, the advent of weapons which contracting and the need for new and elaborate research, test and manufacturing facilities often make the method of self-qualified companies very small.

"In these circumstances, the status quo requirement for industrial bids is both unrealistic and impractical and does not serve the best interests of the government well. The new impossibility of assembly producing costs or the fact that the nation's war effort will take nations negotiations with qualified companies the only practical path to follow," he said.

### Negotiated Contracts

The general trend that Defense Department has, in fact, been trending toward more negotiated contracts but only as a series of exceptions rather than as a general policy.

"The last day, coming government industry, simple stated, and avoided over the years as a legal people that must be the process of the most costly," he said.

There are other rules that create problems. "When a system manager comes to the point where the books of an account or subcontractors must be submitted, he runs into the problem of proprietary and confidential information. We have discussed around this problem by cutting in the government but as a result we often find ourselves without knowledge and therefore communications with the responsibility we have assumed."

Since private companies are doing much that was once done in the government shops, it is natural that the government should be more deeply involved in the affairs of the companies, he said.

His overall perspective of govern-

ment is the contractor's business was once rather solid and the policies of firms doing business with the government were designed to keep it that way. Now, instead of seeing a different kind of product and the general rules have changed. We get paid not only for hard work, but for managing a vast program involving huge sums of which only a small portion actually goes for manufacturing materials, manufacture. That we are now doing much that private sector need to do, and dispersing federal funds to support under contract to us. We are under the obligation to be responsible to government policy, in virtually every case of our activities," Douglas said.

He said that business must learn to realize that the government's needs and economic philosophies as reflected in government and that government should reward companies with more responsibility and trust.

### Private Enterprise

Douglas questioned the attitude of government toward defense industries and asked whether it should be regarded as true private enterprise.

"If we have private enterprise and that feeling extends to our defense industry, do the moral perspective of a commercial enterprise apply? Must the defense contractor develop his corporate image as he did in commercial or personal community relations and the winning of risk capital? The more over, contractor advertising looks more to that, the it is more commercial in this question," he said.

"We must make up our minds whether we are against the business in a fundamental sense, in whether we recognize that the demands of new technologies are such that only by non-traditional organizations can rise to the challenge. Very large companies or groups of companies and a sweeping of cooperation may be an unbreakable part of maintaining a strong aerospace industry."

The government quite properly is not interested in paying routine maintenance costs to support inefficient facilities. But will it permit, let alone further margin designed to improve the situation? I don't think there is yet a clear answer. As examples of non-traditional policies, Douglas mentioned the fact of government re-deployment in the proposed acquisition of Polaris Corp. in Ford Motor Co. while the quality King-Tennant-Vought is under fire in the Department of Justice.



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## Rocket Society Analyzes Space Problems

New York—Progress and problems in U. S. space vehicles, missions and global efforts were summarized in four American Rocket Society panels at the AHS Space Flight Report to the Nation held here recently.

The panels were highlighted by:

- Technical problems and progress in the Apollo manned lunar landing discussed by Robert R. Gilchrist director at NASA's Space Task Group.
- Military requirements in space, reviewed by Travis Gurnea, president of the Elcom Manufacturing Co.
- An appeal to "think out of the groove" to solve the key technical problems, made by Norman F. Dow, controlling engineer for the General Electric Co.'s Space Sciences Laboratory.

Gilchrist said Project Apollo will be one of the most intense efforts ever undertaken to provide complete and reliable data space coverage with high quality control and human consideration. He said the rendezvous technique may provide the only means of accomplishing the Apollo mission quickly, and he listed four major technical problems, most which must be overcome before Apollo can be conducted. Thus, no rendezvous, early landing, lunar landing and vehicle performance and reliability.

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### Re-entry Data

Gilchrist said re-entry technology data being obtained indicate the problem of performing a new design in 14,000 ft/sec re-entry velocity appears solvable. A desirable passivity or Rogallo-type air force could be used to avoid hazards in re-entry landing. Gurnea said, he said, will require a generally well-accepted, and the technology of the lunar mission program will contribute to the solution of this problem.

Gilchrist said the country is "approaching the end of the beginning" in manned space flight with Project Mercury, which has not only confirmed man's ability to function in space, but also has initiated the development of a combined Defense Department and NASA management base for future programs.

Apollo will require an expanded manufacturing capacity and creation of new resources and manufacturing capabilities.

Apollo does not yet have a proven detailed configuration. He said, however, a plan is being developed, although not yet definite, for a long-duration space laboratory and that rendezvous may be a key factor in Apollo plans. Re-entry problems do not include jet performance and launch vehicles, he said,

but extend to the critical area of payload equipment.

Panel 2 space suit technology leaves much to be desired, since the plot is actually available in an inflated suit. The plot itself, Mr. Gurnea's words, is a "low priority item."

Gilchrist appealed for recognition of military space requirements. Economic and policy problems are hampering the military space program, he said, but the difficulties in big business are the same for both civilian and military programs.

The fact that today's space policy is oriented toward science in "line," Gurnea said, but military space missions are needed, and decisions for them are needed from a high level of government.

### Council Inadequacy

He said the relationship between NASA and the Defense Department must be tightened, and that the Joint Space Council is not enough.

Gilchrist said he predicts the Soviets are conducting in space look "more and more like military" experiments, and the secret intentions of Russian mis-

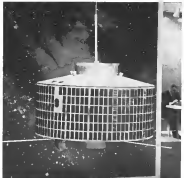
trils tests "signals bigger business."

He said space rockets, payloads, payloads in nuclear energy, nuclear missiles, rockets and electronics, have developed various civilian applications. He said there is a need to develop a system for reconnaissance and capture of satellites, but "no such program is under an accelerated status."

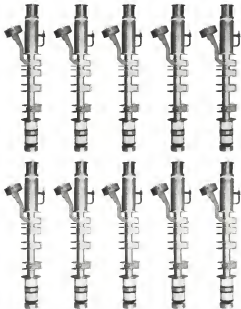
### Radiation System

Gilchrist said he is not making a case for a radiation space support system, but there are a number of possibilities to think about. Among them are beams in orbit, hardened bombs and "test" space fleet, using ships and conventional for manned space vehicles.

Dr. Oskar Margenau of Princeton University pointed out that prospects for international cooperation in space are dim, since there are such vast gaps between them and the border. He said, "The most important without collaboration in technology, and space control will be easier to achieve than nuclear control." Gurnea said, using space and technology to think carefully to solve these problems, listed these problems.



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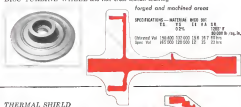
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as radiation, re-entry and re-usable. He suggested dramatic deflection for radiation shields, Roglo-type devices to handle the re-entry re-usable two or three times, and re-usable while in a lunar orbit to decrease the effects of gravity in an earth orbit.

An electronic shield can be effective, he said, if a system can be developed which can produce 10,000 volts per mile conductor. Reflective fabrics can survive re-entry heat loads.

Willa M. Hirsberg, vice president and general manager at Lockheed Missiles and Space Co., said vehicle problems center around sufficient knowledge and the fact that dollars are made available for space progress each year.

He said the U.S. "has a long way to go in reliability," particularly in safety, durability, and life support systems. He suggested investigation of "human design," at Lockheed for lower and safety measures, since less than half the life support materials will be required with this technology.

## Simple Satellite Needed

John R. Fazio, director of research for Bell Telephone Laboratories, said communication systems to be the only space field with direct commercial application. He said re-entry, re-usable, and re-usable are required in reliability and predictability, and a simple satellite, with a maximum of 1,000 components, may be the first approach.

Calvin said it is inherently difficult to assure Cosmonauts Chertom Titov reported during his flight. He said Soviet comments "are considerably stronger and less representative" than those in Project Mercury and this may be a factor in his selection to the flight.

Calvin said he is not certain that interest there will be maintained by all astronauts and he is not convinced of the need for artificial gravity for extended manned space flights.

Don G. Mitchell, vice chairman of the board of General Telephone and Electronics Corp., said industry's major challenge is to reorganize the operations of space when it sees them. The real space science and technology will stand the industrial benefits of nuclear power and electronics, particularly in the area of:

- Propulsion, which will be affected through new chemical techniques and processes developed for rocket fuels. Simple and highly efficient propellers for aircraft and automobiles and new concepts in power generation will benefit.
- Instrumentation, which will benefit from electronic hydraulic and mechanical systems used in space vehicles.
- Electronics, which has been hit with its strong emphasis on mechanical and mechanical structures.
- Structures, which may benefit

from medical and health problems while it solves problems of man's survival in space.

Industry will benefit from re-entry materials, re-usable, and possibly from the ability to harness radiation, Mitchell said.

He pointed to the great potential in communications satellites as a solution to the present problems in overseas communications. Number of calls from the U.S. to the rest of the world, which will number four million this year, will grow to 100 million by 1980, Mitchell said.

U.S. and Soviet space programs were evaluated at an evening session during which the panel moderators, Arthur C. Clarke, past chairman of the British Interplanetary Society, put 16 questions to a group composed of Dr. Hugh L. Dryden, NASA deputy administrator, Gen. Bernard A. Schriever, Air Force Systems Command commander, E. J. Knapp, Rand Corp., Dr. Arthur K. Lewis, Avco Corp. vice president, and Dr. Werner von Braun, director of NASA's Marshall Space Flight Center.

Clarke thought the discussion, Kosmonauts and Dryden stated clearly and opposing views on the military and civilian uses of space. "It is a fiction to say that there are two space programs, one military and the other civilian," the Avco scientist said. He pointed out that space technology is basic both to the military and civilian programs and, as such, there should be one overall national effort in space.

Dryden said that there was a definite military role in space, centered by saying that the end applications of military and civilian programs differed and therefore necessitated separate efforts. Many as-

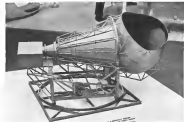
tronomers thought it significant that Kosmonaut's remarks drew heavier and longer applause than the usual batch of AMS speeches and general public in the audience.

The question of the cosmonauts' trip stage came up again at the panel session, as it did frequently throughout the week-long AMS meeting. "We will make a decision by Christmas time," Dryden said, "as to whether this trip stage will be our main line of attack." Kosmonauts asked von Braun why the U.S. is not exploring its present launch capabilities with vehicles like the Atlas or Titan to achieve an early ability for cosmonauts (NAV Sept. 4, p. 68).

## Apollo Launch

Von Braun answered that it would require about 400,000 lb. in order to launch an Apollo vehicle of 150,000-165,000 lb. in a lunar cruise. To assemble that weight in orbit, von Braun said, would require around 300 Atlas or Titan boosters and the problem would be similar to "being the Berlin airlift with Paper Cuts." Dryden said that NASA had studied the possibility of using existing boosters for cosmonauts but was "appalled at the material and logistic problems involved" and that the prospects of assembling 150 or more boosters in space was "highly risky." Both Dryden and von Braun agreed that no more than two or four cosmonauts could be handled conveniently on the availability of an orbiting space support facility for Apollo vehicles.

Clarke said that Soviet Premier Khrushchev had boasted recently that the USSR would soon place 30 tons in orbit and asked the panel members how soon they thought the Soviets and the



BELL TELEPHONE SYSTEM'S space communications ground system near Randall, Md., will feature dual beam for bearing communications to satellites and receiving from them. The beam is 177 ft long and 94 ft high, and weighs 210 tons. Construction is currently under way on the ground structure.



U. S. would accomplish the first. No panel member ventured a guess on target dates, but Gen. Schriever noted that "they [the Soviets] have not to say, that they intended to do something and then failed to produce it previously. I wouldn't be surprised if they achieved 50 tons in the near future."

Dryden said that the Soviets have shown continued improvement in their booster engines going from four to seven tons per second. Von Braun described the booster competition between the two nations as a "bidding" business and said that the U. S. now has a potent under development that could lift "double 50 tons" into orbit—presumably the Saturn C-4 vehicle.

In discussing the time, money and scientific talent that U. S. industry devotes to the study of proposed satellites, all five panel members agreed that this was wasteful but unavoidable in a free enterprise system. Von Braun said that he had recently talked with Leonid I. Solov, USSR Academic of Sciences, and asked the Soviet scientist which agency in the USSR reviews new proposals. "Uchrasnauka," Solov replied according to von Braun. "We do not have the problem." The Soviet scientist went on to say, von Braun reported that the collectors must be periodically stored up to abandon old projects and start development in new concepts. "Where we may have had such concentrations," von Braun said, "it would appear that the Soviets may have too little."

Discussing global communications systems, Krueger said that current Soviet literature contains many references to communications satellites but that he believed that this was a step for the Kromer people and not an indication of any Soviet competition for the U. S. in this area. "Besides," the RAND physicist said, "a communications satellite system would complicate their security program" by providing other systems with another means of penetrating unsecured areas to the Soviet people.

Dryden noted that it was an interesting side fact of the Soviet program that the USSR has not launched a general scientific payload since Sputnik III, all subsequent satellites and missions have been in direct support of manned space flight.

The charge that the U. S. has tended to emphasize the scientific aspect of the race in space, was denied by the NASA, Dept. administrator. Both NASA and the Defense Department from the beginning have agreed," Dryden said, "that the space program could be complete without one." Gen. Schriever added that one was so essential part of space exploration and cited the K-15 program as an example where some vehicles would have been but had a one not been used in the system.



LUNAR ROVER CONCEPTS developed by Bellini Corp. of America engines were featured in American Rocket Society's Space Flight Report to the Nation. Larger model showed weight to show legs (adapted to left and shown fourth), under canopy and third out of legs to maintain stability during walking. Space Group's concept of a Prospector being lunar vehicle (below) consists of two hexapodal configurations, mounted close together, one with three wheels. A smaller diameter antenna wheel is located to the rear of the vehicle. Propagating above and behind the vehicle is a solar collecting shield in a communications antenna. Between the hexapods is a launch tube for the other rocket that would bring back to earth data and samples of the lunar environment. Krueber located about the vehicle's most serious need a television camera in a position ship out of the hexapodal configurations. Space says that some of the extendable equipment could be folded into the gap between the hexapods for landing.



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## Micro-organisms Die In Space, Tests Show

Recent vacuum chamber tests at Hughes Aircraft Co., Culver City, Calif., indicate micro-organisms cannot survive long in a space environment and that it may be possible to eliminate the expensive practice of sterilizing space vehicles.

The tests were made in a facility which includes high vacuum pumps, multiple test chambers, liquid nitrogen traps and provisions for collecting and analyzing outgassed or evaporated products as part of a comprehensive space environment study program.

Only a comparatively few types of micro-organisms out of hundreds of thousands known to exist have been tested in the program, but Hughes scientists feel it is significant that not a single one tested could withstand prolonged space exposure.

Some organisms survived viable after exposure for 10 days at a pressure of  $5 \times 10^{-6}$  mm Hg, equal to 300 mi. above the earth, but all specimens died after exposure for 30 days at pressures of  $1.2 \times 10^{-6}$  to  $5 \times 10^{-6}$  mm Hg, equal to 100 mi. altitude.

The vacuum facility, constructed by Hughes laboratory staff, can simulate high vacuum, the best junk of space, thermal extremes and visible, infrared, ultraviolet and high energy ionizing. Gas purities will reproduce the nearly pure vacuum on the moon.

Made entirely of Pyrex glass, the apparatus encloses specimen chamber and air purging. The system is regularly maintained at  $5 \times 10^{-6}$  mm Hg. (258-mil. at triple) through use of special valves and control sealed ground glass joints. Pressure in one chamber or area of chambers can be ion pumped to  $1 \times 10^{-6}$  mm Hg. (190-mil. white) before can be run continuously for months.

Any culture can be brought in to atmosphere pressure without disturbing other active tests now in progress. Only a few minutes are required to reach a given low pressure to avoid even active chamber for testing itself down.

## Convention Recruiting Ban Favored by Firms

More than 75% of a total of 260 companies recently queried would favor a ban on recruiting engineers and scientists at technical conferences, and 87% of those surveyed said they would abide by a general industry agreement to forbear convention recruiting. Majority of the companies is in electronic and electronics fields. Of companies surveyed by Dunlap & Shaw, Inc., an advertising company in New York, 65% were located at conventions.

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## Beech Revising Plane Promotion Methods

By Emory J. Redden

Wichita, Kan.—Simultaneous introduction of a complete line of business aircraft is being abandoned by Beech Aircraft Corp. for the 1982 model year. The recent management decision is attributed to cost pressures on the company and its field organizations which in turn severely hamper visual engineering and marketing programs.

Introduction of the 1982 versions of the Model 33 Debonair single-engine four-seater and the Model 61 Queen II twin-engine have from this month follows the pattern which the company is experimenting with in its program.

Previously, the Beech plan calls for dropping the traditional annual informational sales meeting scheduled at the factory here by thousands of distributors, dealers and their sales and service personnel and substituting instead a program of taking several models at a time over an extended period directly into the field for introduction at the distributor-dealer locations.

• Reducing the line on costly roadshows for the sake of saving distribution, a "new model from the previous year's program" and natural field force presentation in on a more intimate basis in the course of a week's life span.

Indicators are the considerable pro-



DEBONAIR radio grouping is placed on a panel tilted outward to provide ease on the left and with improved access to the controls.



MODEL 8-33 DEBONAIR optional fuel tanks is 10 gal. for a total of 50 gal., permitting flights of 3,131 mi. nonstop.

cess has been exerted on Beech's estimation by its influential distributors to stress the new course. For one thing, the traditional annual meetings have grown over the years to the stage where the field organizations have felt it necessary to have a number of their key personnel attend if the various segments of their operation—for example their individual product management—were to obtain maximum use of the opportunities.

These attendees could, strictly speaking, not a week's time or perhaps longer absence of these people from their own sales and service responsibilities back home was hardly felt. A common sight of such a meeting was seeing of numerous attendees and their traveling to nearby long-distance cities from their home offices relating to a problem that had come up regarding their personal situation. In some cases, a person who had been visiting for a considerable time would decide that that was just the time he would like to make his decision to purchase.

Attending these meetings also became costly in travel entertainment and living expenses for the distributor, dealer and the parent company. These posed a considerable strain on the organizations for weeks in advance of the meeting in making preparations.

Distributors and dealers feel that the benefit of making the previous models "available" each place a temporary lease (lease) status on their organiza-



FRONT SEATS of 1982 Beechcraft Model 8-33 Debonair have been redesigned to provide four-point restraint and three-point toe and tilt movement. Price of the base Debonair is \$21,975, approximately \$225 higher than last year's airplane. Company, however, has designed an optional equipment package at a before-reduced price of \$1,750, that provides a saving of \$700 over other similar packages.





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For further information contact: "Marketing Department," ITT Federal Laboratories, 500 Washington Avenue, Nutley, New Jersey.



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ADDITIONAL CABIN WINDOWS call air traffic between forward engine window and aft. Cessna 310 Skylight from earlier 530P.

### Aviation Week Pilot Report

## Good Controllability Is Cited in Skyknight

By David A. Brown

New York—Cessna Aircraft Corp.'s Skyknight is a turbo-supercharged light twin designed primarily for business owners who want high airspeed performance in a low-cost aircraft, proven itself in flight to have excellent controllability at low speeds and in stressed attitudes. The five-place airplane is featuring of pilot seats and pedestal, and through a wide range of flight conditions.

### Follow-on Model

Designated Model 310, the Skyknight is a logical up follow-on to the non-supercharged Model 310P (AW Nov 71, p. 97). The Skyknight is built around the basic 310P structure, with changes whose necessity to incorporate improvements.

Modifications to the new Cessna aircraft include:

- **Wing and nacelles**—The basic 310P wing structure has been modified in the region around the engine nacelles to accommodate the added weight of the new nacelle and the instrument turbo-supercharger. The nacelle airducts and the nacelle have been removed and the 22-in. deep nacelle fitted into the wings. "Six-inch" lower underwing nacelle houses auxiliary open and closed flaps which control engine operating temperatures. Engines are mounted on rubber shock mounts and

a new exhaust system employs expansion bellows between each cylinder exhaust outlet and at the rear of the engine. A standard steel protection shield and firewall separates the engines and the turbo-supercharger from the wing structure. Two air intakes have been added to each wing, one inboard and one outboard of each nacelle. The additional inlet provides engine air to the supercharger turbine and surrounding area, but Cessna says there is no major heat problem regarding turbine operation. The inboard inlet supplies air to the turbo-supercharger. In addition, there are two automatically operated auxiliary supercharger air inlets. They are upstream from the supercharger on the left and are equipped with a closed filter in inlet. Each nacelle has two underwing outlets one for engine exhaust and a second for the auxiliary supercharger exhaust vents into which holds engine operation to a maximum of 15 in. Hg. manifold pressure regardless of throttle or mixture setting, already in process.

- **Package**—Skyknight's landing gear has been dropped 15 in. from the station immediately aft of the pilot's seats to the rear of the airplane. Most noticeable effect of this is the increased handroom and leg room available for the 15th passenger. The two passengers are noticeably behind the pilot and benefit from increased room.
- **Engine**—Angle of incidence of

the elevator has been changed from the 310P's -1 deg. 44 min. to 0 deg. Effect of the change is to give the Skyknight a more "on the step" side and to eliminate some drag found in the earlier model.

- **Engines**—Skyknight is powered by two Continental TSVO-678-B horizontally opposed, overhead fuel injection engines, equipped with Aftersmith Model T-1130 turbo-superchargers. The turbo-superchargers enable the engines to maintain their full rated output of 200 hp at 2,600 rpm and 15 in. Hg. manifold pressure to a critical altitude of 16,500 ft.

To evaluate the Skyknight the Aviation Week pilot flew around N 1301N with Cessna pilot Terry Lankster in the New York City area.

Engine starting is simplified by the use of separate automobile-type key starter switches for each engine. Switches positioned from left to right are 116-Rich/High/Start. The optional oil dilution system is achieved by pressing in either switch.

### Takeoff Procedure

Starter switches were used in the start position in the first five takeoffs, rated 2 to 4 gals. flow and the engines, were from previous run caught about 1000-1100 rpm. Mixture was checked for a maximum powerable drop of 115 rpm on the full of the mixture and the propellers were checked by

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moving the path control lever slightly into the farther detent on the center console. Fuel tanks were about half full and the aircraft was carrying three persons, full engine gear and a small amount of baggage.

The Starlight broke ground after a run of slightly less than 10 sec. on Runway 11 at McGuire Airport. Outside air temperature at the surface was recorded at 82F and wind was from the south at 10 kt. A heavy scale-lane in the area extended to 5,000 ft and prevented a maximum climb-down attitude. The Starlight climbed the first 5,000 ft building 135-140 mph with the engines peeling 25 in 10 sec. The engine pressure at the base was topped, then the throttles were latched and the engine speed increased to 2,600 rpm and available pressure to 55 in 10.

Indicated airspeed in the maximum climb was 128-125 mph and the airplane was trimmed to hold a climb of 1,800-1,900 ft per minute off. The Starlight climbed from 5,000 to 5,800 ft in 15 sec and then 11,000 to 12,000 ft in 14 sec. The engines showed no decrease in performance to 15,000 ft.

At 15,000 ft altitude, the Starlight reached an indicated 208 mph in level flight with the engines peeling just under 35 in 10 and the outside air temperature at 40F, or about 11F above standard. The IAS converted to a true reading of 261 mph. At 75% of power, the Starlight sustained 151 mph or 248 mph true and at 60% of power the aircraft indicated 170 mph or 214 true.

Supercharger operation at altitude was slightly in excess of the operation manual rating. The superchargers are rated as being capable of maintaining 29.3 in. Hg. manifold pressure at 78% of power at 20F and actually pulled 29.5 in. at 40F.

The right engine was shut down at altitude and the Starlight was maneuvered for level flight. Throttle of it maintained a straight and level path, indicating 127 mph with the left engine operating at 2,100 rpm and pulling 24.5 in 10.

The aircraft would climb in the same configuration at 120 IAS and gain 540 ft per minute at temperature at the time still was 40F.

### Stall Maneuver

The Starlight then was taken down to approximately 5,000 ft altitude and put through a series of stalls in various attitudes and configurations.

Previous stalls first produced a "rocking horse" stall similar to the type experienced under the same conditions in the 310F. The full winging beam loaded approximately 4 mph above the stall and was accompanied by a perceptible and uncomfortable buffeting. The Starlight stalled straight ahead and began a porpoising motion in which it stalled and recovered repeatedly without appreciable loss of altitude.

The Starlight then was stalled power off and the wheel held back until the nose had fallen completely through the bottom. Again the aircraft stalled straight ahead and recovered with power after an altitude loss of approximately 400 ft in both cases. The Starlight stalled at a slightly lower indicated air speed than the 50 mph indicated in the handbook.

With gear down and 10 deg. flap, the Starlight was able to hold 65 mph, IAS without a buffet and with gear and 45 deg. flap, the aircraft flew at 68 mph without a buffet.

The right engine again was shut down and the aircraft stalled in landing configuration (gear down, 45 deg. flap).



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STARLIGHT CABIN has seating arrangement similar to 310. Full out is optional. Standard configuration has jettison seats which will accommodate three persons.

## Microdot Awarded Contract on Midas

LOS ANGELES, CALIF.—Contracts in excess of \$225,000 have been awarded to Microdot Inc. by Philco-Corporation's Western Development Laboratories for UHF remote-based data link transmitters and subminiature to be flown in the Midas missile altimeter circuit.

The Midas project, under cognizance of the United States Air Force, is aimed at development of a national early warning capability through multiple satellite coverage of the earth's surface via indirect receivers. Philco, with responsibility for the instrumentation, is an associate contractor to the Air Force Lockheed Martin & Space Company, prime system contractor, is responsible for the total vehicle and ground elements of the system, integrating associate and subcontractor efforts.



Microdot model 2406A UHF Telemetry Transmitter, similar to units now in production for the Midas missile program.

In May, 1980, a Midas missile was launched into near perfect orbit 300 miles in space. The 5000 pound satellite, over 21 feet high, carried a 3000 pound instrumented package. Then in July, of this year, Midas III was placed into an 1800 nautical mile orbit. Again a near perfect missile orbit was achieved. Confirmation of test flights are anticipated with the program increasing in high priority national development.

For Midas, Microdot will supply their Model 2406A Telemetry Transmitter equipped to include self monitoring and telemonitoring of its own operation. The transmitter is miniatured, packaged, and includes its own solid state power supply. Radiation in case is guarded through use of a unique automatically shielded can act with the output frequency automatically drives to a quartz crystal. The transmitter weighs 12 pounds. Similar Microdot telemetry equipment has been a part of such projects as Pioneer V, Jupiter, Atlas, Penning, Redstone, and Rebel I.

**MICRODOT INC.**



222 Pasadena Avenue  
North Pasadena, California



The words are "project engineer." He's celebrating—again. And every time he does free men shudder. Our job is different. Often cheerless. Because we in the defense business are charged with keeping fingers off buttons. Because the real business of the defense business is survival. *Microdot Inc.*

both in straight flight and in an approach 60 deg bank. With the left engine discharging 75% of power, full left rudder and nearly full left aileron counteracted the Skunklight's natural tendency to turn into the dead engine as it rolled from straight flight.

Directional control was maintained throughout all stalls, however, with aileron control speed's being effective at low speeds. The Skunklight's 51-gal tip tanks act similar to wing end plates in channeling air flow over the ailerons at low speeds.

During a steep turn into the good engine in landing configuration, the Skunklight refused to make a sharp stall, and, although decelerating, cruised on through the turn.

At 75% of power on one engine at 5,000 ft., the Skunklight would climb at 85 mph IAS at 500 fpm.

### Landing Procedures

Landing at Teterboro, N. J., airport was made under unusual conditions due to heavy smoke billowing from a high fire nearby.

At 108 mph IAS 15 deg flaps were lowered and the landing gear and full 45 deg flaps were lowered at 140 mph IAS. The Skunklight was on the approach at 170 mph IAS descending at 900 fpm. Over the tower speed was 90 mph and the runway touched down at 45 mph, gave a 30 ft. hard wheel. Teterboro tower advised that the field temperature was 73F. The Skunklight slowed quickly and could easily have made the last takeoff turnoff with a lot more leeway.

Throughout the flight the Skunklight equaled or exceeded published flight performance, which Gates says was most conservative.

### Instrument Panel

Arrangement of the instrument panel allows both pilots to see all gauges with ease. Flight instruments are grouped in front of the pilot and engine instruments are grouped in front of the copilot. Radios are centered and a center console contains throttle, propeller and mixture controls, trim, autopilot and fuel flap controls.

Starting controls and light switches are to the left of the pilot's control wheel and low and then are, by somewhat out of the way for the copilot. Other switches, however, are grouped across the top of the panel and are within the reach of either pilot. The emergency landing gear extension crank is located in a viewable clip to the right of the pilot's seat.

The Skunklight was designed to fit a pop Gemini ejection seat in the already rather crowded light-twin field. Engineers were called upon to produce an aircraft with light-maintenance performance comparable to high-pressure, open-



SKUNKLIGHT FUSelage has been designed 50 in. aft of pilot's seat, giving cabin bellows appearance. Wing and empennage are basically the same as the B10F.



PANEL ARRANGEMENT is virtually identical with that of B10F. Engine meter flap now both are below autopilot on center console. Autolift disjunct system/autopilot switch beneath pilot's control wheel actuates oil delivery system when pressed.



PILOT'S SEATS in the Skunklight (right) adjust low and aft and tilt. Standard seat seats recline. Note optional table in back of copilot's seat.



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## Skyknight Performance

|   |                |
|---|----------------|
| Top speed                                 | 283 mph        |
| Cruise speed                              | 747 mph        |
| Best cruise altitude                      | 49,000 ft.     |
| Two-engine rate of climb                  | 4,550 ft./min. |
| Single-engine rate of climb               | 498 ft./min.   |
| Two-engine service ceiling                | 27,200 ft.     |
| Single-engine service ceiling             | 12,100 ft.     |
| Takeoff run on a finished airfield        | 270 ft.        |
| to clear 50 ft. obstacle                  | 1,470 ft.      |
| Landing roll on a finished airfield       | 640 ft.        |
| to clear 50 ft. obstacle                  | 1,770 ft.      |
| Fuel consumption at 14,500 ft. at 270 gph | 27.6 gph       |

Note: All performance calculated for maximum gross weight of 4,900 lb. Standard day conditions are 100° at sea level with no wind.

clamped down, in a willing pose not far above the 210, and with a smiling captain more easily in line with what Conna believes is the message for business flights.

First deliveries of the Skyknight were made in August. The current sells for \$67,500; less sales tax and optional equipment. This is \$5,000 more than the 1981 Model 510T price, but the 110 was more in price when the 1982 models came on the market.

## Cabin Arrangement

Despite its lower seating capacity, the 110 will compete directly with the Beech 190 and the Cessna 441Q. Conna believes—Conna owners show that the average business trip by private aircraft usually is made with only three persons on board. Conna's premise is that most corporations would rather have a smaller aircraft at lower cost than pay for a larger plane with more performance when extra capacity will go unused most of the time.

The Skyknight has four cabin seating arrangements with a maximum capacity of five passengers. The layouts include a forward arrangement with the 110s just as the 110s, behind the two second row passenger seats, four passenger aircraft with the rear seats folded down or separated by an aisle, and three single seats plus a lounge-type seat on the left behind the pilot.

Cabin arrangements are available in three, three configurations in the standard configuration or in four of-fother layouts in optional extras. All seats have armrests and there is an optional folding table built into the back of the captain's seat.

A fourth window has been added at the rear of each side of the cabin, increasing window area to 1,917 sq. in. Windows are treated with the exception of the windshield and windows aft of the pilot's seats are double-pane.

New Goodrich dual-engine, dual-



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HO4S: New model rotor blades enables them to lift 500 lbs. increase in lift and rate of climb for longer time



HO4S: Increase in lift (500 lbs.) HO4S enables to lift 500 lbs. increase in lift and rate of climb for longer time



HO4S: New model rotor blades enables them to lift 500 lbs. increase in lift and rate of climb for longer time

**DESIGN AND SERVICE DESIGN ENGINEERS**  
 (SIC) and (SIC) 1-5 p.m. and 1-5 p.m.  
 Helicopter rotors in Civil and Commercial Knowledge  
 Airplane Structure—light weight structures—quantity  
 production

**Mechanical Power Transmission Systems analysis and design**  
 Power Plant Installation—turbine and piston  
 Diesel and Gas Turbine Engines—(SIC) required

**ENGINEERING DRAWING CHECKERS**  
 2 p.m. and 1-5 p.m. production design drawings

**WIREMENTS ENGINEERS**  
 1 p.m. and 1-5 p.m. electrical drawings and components

**AERODYNAMICS ENGINEERS**  
 1 p.m. and 1-5 p.m. aerodynamic drawings



HO4S: New model rotor blades enables them to lift 500 lbs. increase in lift and rate of climb for longer time



HO4S: Increase in lift (500 lbs.) HO4S enables to lift 500 lbs. increase in lift and rate of climb for longer time



HO4S: New model rotor blades enables them to lift 500 lbs. increase in lift and rate of climb for longer time

**STRUCTURES & STRENGTH ENGINEERS**  
 (SIC) and (SIC) 1-5 p.m. and 1-5 p.m.  
 Helicopter rotors in Civil and Commercial Knowledge  
 Airplane Structure—light weight structures—quantity  
 production

**Mechanical Power Transmission Systems analysis and design**  
 Power Plant Installation—turbine and piston  
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**WIREMENTS ENGINEERS**  
 1 p.m. and 1-5 p.m. electrical drawings and components

**AERODYNAMICS ENGINEERS**  
 1 p.m. and 1-5 p.m. aerodynamic drawings

## Financial Briefs

**Brace Electronics, Inc.**, Silver Spring, Md., reported a fiscal 1961 net income of \$44,541 on net sales of \$1,447,416, annual earnings for the company's first year. Sales increased 57.96-620 over fiscal 1960 when income was \$42,804. Per share earnings for 1961 were 17 cents compared with 16 cents for 1960.

**Victor Co.** reported a 30% increase for 1961 over 1960 in its total gross earnings from small business. Total Victor earnings from small firms in 1960 was \$92.6 million. Total 1961 of 1961 earnings from small firms totaled more than \$119 million with a possible full year figure of \$115 million. Victor officials reported.

**Clement Mfg. Co., Inc.**, of Dover, N. H., reported a net income of \$195,645 for the first half of 1961, based on total sales of \$4,649,000. The firm, which produces precision potentiometers and other precision instruments, computers, radio, television and other electronic equipment, showed a loss of \$4,806 from 1960 income of a year possible period, with per share earnings dropping from 42 to 41 cents. Clement President Victor Macher said the loss was due to unusual expenses in

result in preparation for expanding the company's line of products.

**International Rectifier Corp.** of 33 Second, Calif., had a net income of approximately \$1,001,000, exclusive of profits from foreign affiliates based on sales for fiscal 1961 of about \$44.5 million. The company with \$1,206,000 earnings on sales of \$11,124,154 for the previous year. International's figures showed 1961 earnings per share of 47 cents on 2,416,145 outstanding shares of common stock compared with 36 cents on 2,504,491 shares in 1960. The fairly steady profits from zero cost foreign companies was about \$85,000 with no corresponding earnings in 1960.

## Mergers and Acquisitions

**Devinco** has sold to Turner Electronics, Garden Grove, the assets and business of Devinco-Winslow Engineering Co., a subsidiary, and Devinco Pacific, a division, in a kind of management buyout. Devinco's parent company, Turner Electronics, Inc., Dallas-based radio business equipment firm. Not included in the Turner acquisition are land, buildings and equipment, which Devinco is leasing

to the purchaser. Devinco-Winslow produces high-vacuum vacuum and microwave transmitters. Devinco Pacific makes radio and base units in the \$2,000-\$5,000 range.

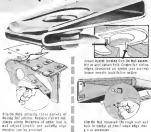
**Burns Engineering Co.** of Stamford, Conn., manufacturer of infrared devices primarily for military and space applications, has signed an agreement to acquire Connecticut Instrument Corp. of Wilton, Conn., which manufactures infrared spectrometer accessories. Connecticut instrument will become a Burns subsidiary.

**Bussell & Co., Inc.**, of Piquette, N. I., manufacturer of electronic test equipment, has acquired 50% of the common stock of CLP Electronics, Inc., of Bussell, Conn., which manufactures electronic test equipment.

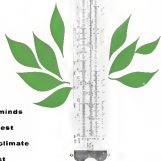
**Rathbone and CBS Electronics** have agreed to conduct joint venture in Rathbone of real estate, facilities and certain investments at Lawd, Minn., from CBS. Agreement was reached following CBS' decision to discontinue its semiconductor operations. Rathbone is not expected to begin operations at Lawd until the actual purchase is made, probably in sometime in mid-October.

## Monadnock self-locking CLIP-ON NUT to replace standard nutplate

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## New Offerings

**Frem Corp.**, East Providence, R.I., producer of oil and air filtration equipment for use on internal combustion engines, and air conditioner filters and other products used by the automotive and aviation industries. Offering: 10,000 common shares. Proceeds will be used to reimburse the company, in the event of such proceeds for such as, proceeds of \$1,500,000 made in connection with the recent acquisition of that part of the business and assets of Sisco Aircraft Accessories, Ltd., of England proceeds devoted to the manufacture and sale of Frem products in England and other countries.

**Transportation Corporation of America**, New York, N. Y., engaged in two transportation operations: a regularly scheduled airline, and a regular water in Washington, D. C. Offering: 10,000 outstanding Class A shares at prices not in excess of those prevailing on the American Stock Exchange. The company has entered into agreements which provide for purchase of 10.51% of the common stock of Caribbean Atlantic Airlines in exchange for the 10.51% Class A shares of the company.

**Missile Systems Corp.**, Beverly Hills, Calif., engaged in the manufacture of complete electromechanical assemblies and systems for space weapons programs, and electronic electronics, and forwarding data processing and data transmission systems, providing facilities trained personnel on a contract basis and preparing technical handbooks and publications. Offering: 1,000,000 common shares, 100,000 shares to be the company, and 40,000 shares to be the present holders. Company's proceeds will be used to carry large amounts and accounts receivable, \$600,000 to cover short-term bank loans, \$60,000 for the liquidation of readily unsecured indebtedness.

**National Tel-Tone Corp.**, Yonkers, N. Y., engaged in the manufacture of standard and custom-made electronic components. Offering: 1,000,000 common shares at \$1 per share. Proceeds will be applied towards payment of a \$50,000 bank loan, covering subsequent pay increases and research and development of new products.

**Cooke Engineering Co.**, Alhambra, Va., engaged in developing and manufacturing electronic products and is providing engineering services. Offering: 32,000 common shares at \$1 per share. Proceeds will be used to purchase new test and production equipment for development of new products, sales promotion of commercial products,

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**THE LEWIS ENGINEERING CO.**  
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**WIRE DIVISION**

**Specialists in High Temperature Wires and Cables**

## PROBLEMATICAL RECREATIONS 89



A man has an odd number of wires running from his basement to his roof. He has available some numbered tags and a meter which detects open and short circuits. In order to label the corresponding ends of the wires in the basement to those on the roof, what is the least number of round trips necessary?

—Coushul

A line of Elliott-Lithman millimeter wire taken for the 10-100 kHz range is available from our Electron Tube Division. Instantaneous picture might read for the 50-page catalog complete with specs and outline drawings. Write: Elliott-Lithman Division, San Carlos, California.

**ANSWER TO LAST WEEK'S PROBLEM:** One. He took 1 resistor from the 1st box, 2 from the 2nd, etc., making 35 in all. He then measured the resistance of 35 in series in series. Deducting 5900 from the total and dividing the difference by 10 gives the number of the box containing the 110 ohm resistor.

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**PUBLISHED: MID-DECEMBER**

**Aviation Week**  
and **Space Technology**

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## LETTERS

## Space for Profit

In reading your excellent periodical I got the definite impression that the entire effort of the United States towards research in space, etc. is through, by and for the United States government.

The United States government was never intended to replace or be substituted for free enterprise. The so-called "space race" with the USSR could be won by the United States if it was conducted in a fashion of free enterprise rather than the United States government.

In defining the above statement, "With private industry engaging its own time and money in space research we would eliminate the multiple redundancies of government-supported programs, we would take the government off the hook with respect to failures and/or successes; we would insert a direct profit into American industry, and we would still be able to supply the military with the necessary know-how and techniques for developing devices for our national protection."

From company to company, it appears you will call at Finance the new entity with funds from a large number of existing companies and provide public offerings of stock and/or bonds. And the job of the new company is a single objective, in specific length of time, after which all interests held by other companies will be returned including possibly speed interest paid, and often the company is continuing to exist as a private enterprise with shareholders. Patents developed and proprietary data would be given to the original participating companies and the given back.

The prime purpose of the company would be to put American and American industry in space, to exploit space and its location resources and power, and manage



First Kaplan I, when undergoing flight tests at Edwards Air Force Base, Calif.—in 1990, was equipped with a fake cockpit canopy to deceive passers-by into thinking that the vehicle was a new type of aircraft. Chatter Vought control pilot Ray Farnum, who controlled the bomber from a jet simulator on the test flight, agrees with the designer's words.

**Attention:** We welcome the opinions of its readers on the issues raised in the magazine's editorial columns. Address letters to the *Editor, American Week*, 1350 E. 42nd St., New York 26, N. Y. Try to keep letters under 250 words and give a precise identification. We will not print anonymous letters, but names of writers will be withheld on request.

environment for people. I firmly believe that no country in the world can compete with Amazon's industry when it comes to exploring its ultra

The original investments could be written off. The final test of such a program would be a function of the government restaurant. Different trying to design and build an automobile to government specifications. There would be no end to the government, following, everything, etc. There would be a failure to have a new and better car.

Fallouts and accidents (which are bound to occur) would not reflect on the government any more than the nuclear accidents when a new car is tested (for example) do a car.

Conflicts of interest such as those that exist between the sensors and actuators today would be eliminated and so would the duplication of effort that goes along with those duplications.

In conclusion (and I may sound like I'm wearing a Reg, but I'm serious), American industry and free enterprise should be involved in advancing the state-of-the-art of military space plans, space stations, manning the satellites, space research laboratories, solar power systems and telelinks—all to profit—all because it is a new frontier that exists only similar to those of years past that have been conquered and developed by free individuals.

Thomas J. Green  
Executive, CML

### Conservative Protest

I would like to comment on the editorial which appeared in the Aug. 14 issue of your magazine.

The writers of the editorial entitled "Conservative Dog" was both disgusting and inaccurate. To begin with, most conservatives recognize the value of a manned space program. Sending the Russians to the moon is very important in our struggle against communism.

"If your editorial staff members were as widely read as they should be, they would surely be aware that conservatives are leading the anti-communism effort."

It was necessary to claim that alienation is being individualized and homogenized. "Alienation is a doubly social and a doubly personal force, particularly at the 'grass roots' level. Ultraconservatism is advocated by very few people because any rational viewpoint is undesirable."

I hope that you were not trying to use one President Bushman's words with utter credence, as even limited conversation. It should be obvious from his words and actions that he is at best a "madman." Mr. Bushman's policies were more than as short-sighted as those of any I know, and no true conservative would like to be associated with his policies.

In the future, please don't be so quick to make recommendations, particularly by agreeing it with me, without whose opinions are detrimental to an association.

S. FARMER  
1984

## Crash Solutions

For some I have read of the expensive painting and lighting efforts of both the station industry and the government to reconstruct the images of ousted leaders in an attempt, frequently in vain, to discover the causes of complained malfeasance (usually those without malfeasance in comparison).

<sup>2</sup> I have a suggestion that I believe to merit that would certainly almost always guarantee the survival of an equal nation (thereby eliminating most of the frustrating chaos related to doing so).

Why not require all Indians to furnish at least one specimen each for the High Museum of Zoology, making its use mandatory when it appears that a creek is as valuable or important?

Think what it would have meant if such a person had been available to the FBI, which has just released the findings of the Capote-Auburn Vietnam rush near Waco, Texas, Vi., nearly two years ago, as the Hunsicker-Ridgely rush, the Eichen and Crenshaw in Chicago, also all the same year.

Clearly, the expense involved would be quantified in the possible saving of human lives alone, let alone the speed of finding the cause.

J. A. FARRAR, JR.  
Tucson, Ariz.



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